THE ENGINEERING CONSTRUCTION WEEKLY

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MAY 27 1938

Engineering NEWS-RECORD

May 26, 1938

Waste gas burners at the new Clayton sewage disposal plant, Atlanta

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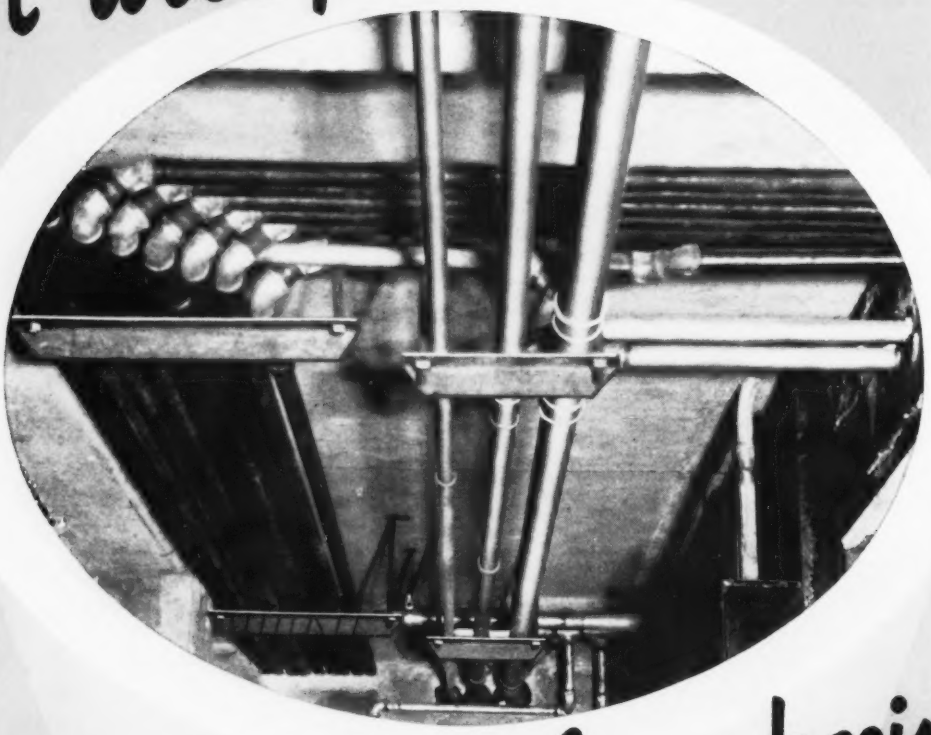
It will pay you . . .



to look into this line of pipe

To install piping systems that are sound — that are economical not only in first cost but in cost per year of service — requires a complete line of pipe — such as the Republic line.

Republic produces a range in materials that provides for every condition of service. For ordinary service, you can use low-cost Republic steel pipe. Where atmospheric or alternate wet and dry corrosion requires a better material, you can install Republic copper-bearing pipe. For installations where corrosion is a serious factor, you have available rust-resisting Toncan Iron pipe. For mains and pressure piping up to 16 in. O. D., there is Republic electric weld pipe. And for applications where severest corrosion and heat are encountered, there is ELECTRUNITE ENDURO Stainless Steel tubing. Republic also makes high quality water well casing. Large diameter pipe made by welding plates may be had for sewer and water mains.

Write for full information on the complete line of Republic tubular goods. Republic Steel Corporation, Cleveland, Ohio.

REPUBLIC STEEL

REPUBLIC STEEL

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· ENGINEERING NEWS-RECORD ·

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VOL. 120 *MAY 26, 1938* No. 21

THIS WEEK AND NEXT

"ATLANTA is an island practically surrounded by sewage," said a one-time mayor of that city. We wonder what his sentiments would be today as Atlanta is bringing to completion the $7,000,000 sanitary improvement program described on p. 741.

The new large-scale low-rent housing program, for which the federal government is beginning to make loans to municipal housing authorities, is governed by different requirements than have heretofore prevailed in the several attempts at public subsidized housing. Nathan Straus, administrator of the United States Housing Authority, the leading and supervising body, describes these requirements in a special program.

Bad underground conditions at the Algerian dams described in our issue of Dec. 2 called for unusual precautions in construction. How underdrains were combined with cement and chemical grouting is told by I. Gutmann.

The State of Washington scrapped its old highway laws in 1937 and wrote a new set. L. V. Murrow, state highway director, tells in this issue of the great advantage of this simplified and modified set-up.

A nationwide survey of our roads, of the type and amount of traffic, and of the kind and character of improvements is now well along toward completion of the initial stage. How the survey is being conducted, how the facts are being recorded and how they are to be used as the basis for developing sounder planning of our highway transport system is the subject of two articles to be in the June 2 and 9 issues.

How New York City is moving fill from an island in the East River to build a great airport is to be described in a forthcoming issue.

		PAGE
The Week's Events		729, 759
Reader Comment		736
Editorials		738
Pictures in the News		740
Seven Million for Sewage Disposal *(Plant description, Treatment process. Mechanical equipment)*		741
New Clay Tile Floor System *(Building construction, Beam design)*	ELWYN E. SEELYE	745
The New Public Housing Program *(Financing. Construction methods, Employment)*	NATHAN STRAUS	746
Algerian Rockfill Dam Substructures *(Underdrainage, Chemical and cement grouting)*	I. GUTMANN	749
Book Notes and Reviews		752
Code Unifies Road Work *(Highway legislation, design, maintenance)*	L. V. MURROW	754
Memorial Tower Construction *(Reinforced concrete, Ornamental concrete, Stone)*		758
Unit Prices	*Adv. page*	20
New Aids to the Constructor	*Adv. page*	24
Construction Reports	*Adv. page*	35

THE COVER PICTURE shows the waste gas burners at the new Clayton sewage disposal plant in Atlanta. The highly explosive digester gas not used for power is vented to these stacks, where it can be burned without hazard. *ENR Staff Photo*

Number of copies of this issue printed: 33,333

Dallas finds Permanent Traffic Markers do a better job—*and save money too*

CITY OF DALLAS
TEXAS
HAL MOSELEY
CITY MANAGER

May 2nd 1938.

Universal Atlas Cement Company,
208 South La Salle Street,
Chicago, Illinois.

Gentlemen:

You will be interested in our experience with traffic markers and buttons made with Atlas White cement, particularly at the intersection shown in the attached photograph.

This is the heaviest traveled intersection in Dallas, carrying more than 30,000 vehicles daily. In the late afternoon rush period traffic flows outward on both streets at once.

We have found that the use of a modern traffic control system and proper channelization with permanent markers and buttons have practically eliminated accidents and, by smoothing out the flow of traffic, in many cases have tripled traffic handling capacities.

We have also found that permanent markers made with white cement save us money in the long run because with permanent markers we save the expense of constant re-painting.

Very truly yours,

W. L. Jones,
Chief of Police.

By C. G. Beckenbach,
Traffic Engineer.

• Read the letter reproduced here. It states the case for Atlas White markers from the side of practical experience.

Highway and safety officials everywhere are finding that permanent traffic markers made with Atlas White portland cement not only do a splendid job of smoothing traffic flow—they put an end to marker maintenance expense—actually pay for themselves in the savings they effect. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South LaSalle Street, Chicago.

M-21

Traffic, usually very heavy at this Dallas intersection, was halted while this picture was taken in order to show the traffic marker system. Markers of Atlas White installed under supervision of C. G. Beckenbach, Traffic Engineer.

USS

ATLAS WHITE PORTLAND CEMENT
FOR TRAFFIC MARKERS

THE WEEK'S EVENTS

Design Restrictions On Possum Kingdom

FPC grants license for dam conditional on maintenance of certain unit stresses

In awarding a major license to the Brazos River Conservation and Reclamation District for the construction and operation of the Possum Kingdom flood-control and hydro-electric dam, the Federal Power Commission not only required that operation of the project be subject to rules set by the Secretary of War in the interests of navigation but also that it be subject to rules prescribed by the commission "for the safety of the dam and for the protection of life, health and property."

The commission further required that the dam be so designed that under all conditions of loading the maximum compressive stress of concrete be not more than 800 lb. per sq. in. in members using Class A concrete with an ultimate strength of 3,000 lb. Moreover, the maximum tensile stress in reinforcing steel is required not to exceed 18,000 lb. per sq. in.

Depth and treatment of foundations of the structures in the project must be approved by the commission after the foundation excavations have been made. Moreover, the district must alter or provide additional protection for the downstream portion of the dam if the commission considers it necessary to prevent destructive action from the overflow after the dam is placed in operation.

Other conditions in the license include a requirement that construction begin before Dec. 31 and be completed by July, 1941; requirements for reservoir clearing; and a requirement that, after the project has been in operation 20 years, revenues above 6 per cent on investment be used for amortization.

The Brazos district has asked a rehearing on the commission's finding that a license is necessary and contends that because the development will not interfere with navigation, a federal license should not be required.

The Possum Kingdom Dam will be a multiple arch structure rising about 154 ft. above the bed of the river. The power house will have an initial installation of two 10,000-kw. generators with provision for later installation of an additional 10,000-kw. generator. The dam is being built under supervision of the district's own engineering forces; Ambursen Engineering Co. of New York City are the consultants. The contract for construction of the dam was recently awarded to C. F.

continued on page 732

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Flood Control Bill Passes House

The omnibus flood control bill was passed by the House May 19 substantially in the form reported out by the committee (*ENR*, May 19, 1938, p. 698). The bill, which authorizes about 150 local flood protection projects and 100 reservoirs which will cost the federal government about $375,000,000, was also approved May 21 by the Senate committee on commerce.

Outstanding new provision of the bill is the reduction in the local contribution for reservoir projects from the full cost of land and rights-of-way as formerly to only 30 per cent of this cost.

The bill also authorizes evacuation of communities from flood channels, when this is cheaper than protection. The Eudora and Morganza floodways in the lower Mississippi River are separated in the bill, so that either one can be built as soon as rights-of-way for it are obtained.

MAJOR NEWS

	Page
Possum Kingdom License	729
Flood Control Bill	729
Authority Salaries Taxed	729
New York Engineers	730
Utility Sells to TVA	732
Bonneville Fishways	733
A.G.C. Spring Meeting	734
Cement Bids	735
Falls View Bridge	735

Port Authority Salaries Taxable

Supreme Court holds salaries paid by Port of New York Authority subject to federal income tax

The salaries of three officers of the Port of New York Authority were held subject to the federal income tax by the U. S. Supreme Court on May 23. The court held that these taxes would be passed on to the state only in an indirect and conjectural manner.

The court specifically pointed out that its decision left unanswered the question whether a federal tax might be imposed on the port authority itself.

The Port of New York Authority is a public corporation created by compact between New York and New Jersey and authorized to acquire and operate terminal and transportation facilities in the area around the port of New York. It has built and operates a number of toll bridges and tunnels, an interstate bus line, and a truck terminal. By state legislation, the property of the authority, and the bonds it issues are exempt from state taxation.

The Commissioner of Internal Revenue attempted to collect taxes on the income of Phillip L. Gerhardt, an engineer for the authority, Billings Wilson and John J. Mulcahy, assistant general managers. The Board of Tax Appeals found that the port authority was engaged in the performance of a public function for the state and ruled that the tax could not be collected. The Court of Appeals upheld this ruling.

Reviewing the history of taxation of state agencies, the court pointed out that exemption had been granted where the function involved was one thought to be essential to the maintenance of a state government, but refused when it was a function which could be carried out by private enterprise and therefore "was not one without which a state could not continue to exist as a governmental entity." In addition, immunity has been granted, in a very narrowly restricted sense, in cases where some part of the burden of a tax collected from individual taxpayers is said to be passed on to the state.

continued on page 733

New York Engineers Seek Self Regulation

State society starts movement to center all professional control in a new department

Engineers of New York State assembled in New York City for the 11th annual meeting of the New York State Society of Professional Engineers, on May 21, gave their endorsement to a plan calling for more complete self-regulation of professional men within the state. The plan calls for establishment of a new department within the state government to be known as the Department of Professions which will take over the regulating functions relating to all professions now exercised by the Department of Education.

The department would be under a commission appointed by the Governor and made up of representatives of the several professions. Through the commissioners the professions would have a direct contact with the Governor and the Attorney General which is now denied them, the regents of the Department of Education having final say as to what matter shall go to the Governor. The proposed department would increase self-regulation by the professions and would serve as a clearing house for matters affecting relations between the professions such as legislation proposed by one group that restricts the activities of others.

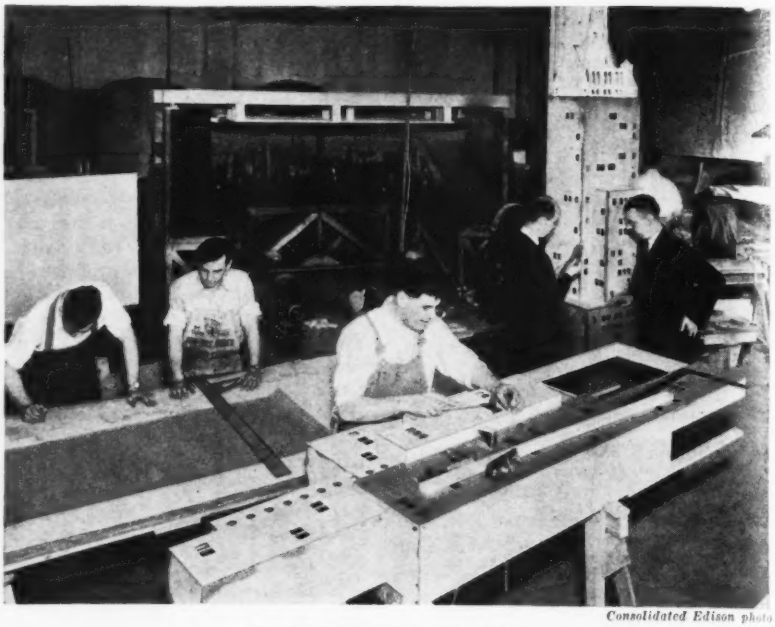
Legislation proposing such a department is to be submitted to the Constitutional Convention now in session.

Internal difficulties

Action looking toward elimination of difficulties within the professions was adoption of a resolution calling for closer cooperation between engineers in private practice and those in civil service to the end that neither group will put forward legislation affecting engineers without first discussing it with the other group.

The status of land surveyors within the society was the subject of considerable discussion and though no formal action was taken the prevailing opinion seemed to be that the society should work for elimination of the land surveyor as a special class so that ultimately all applicants would be required to take the one examination, that for a professional engineer's license.

Alfred E. Roche was reelected president as were the two vice-presidents, F. H. Zurmuhlen and Andrew K. Johnson, the financial secretary E. F. Fox and the treasurer Patrick M. Corry. New directors are: I. W. Conway, G. J. Nicastro, and Albert W. Spencer.



Consolidated Edison photo

MODEL BUILDERS PARADISE

MODELS of many of the buildings in New York are being built by the Diorama Corp. of America for the Consolidated Edison Co. of New York. They will be used in a diorama of New York City to be exhibited at the New York World's Fair, 1939.

Nearly a city block long and higher than a three-story building, the diorama will show more than 4,000 buildings with electrically lighted windows as well as having working models of city traffic and the subways. Entitled "New York, the City of Light," the model will go through a 24-hour lighting cycle in twelve minutes.

Reciprocal Licensing In Northwest

The boards of engineering examiners of Oregon, Washington and Idaho will give "full faith and credence . . . to the examinations given by either of the other boards in passing upon applications for reciprocal registration, in so far as the statutes of the states permit." according to a resolution adopted at an informal meeting of representatives of the three boards held in Portland, Ore. early in May.

The boards also agreed to exchange examination questions used in each state for the confidential information of members of the other boards. A separate resolution invites California and British Columbia to do likewise.

The three boards further agreed to interchange information on action taken by any board in accrediting curricula of engineering schools in the respective states. The meeting went on record as approving the adoption, in so far as possible, of the list of accredited under-graduate curricula of the Engineers Council for Professional Development.

Adoption of a uniform application blank and a uniform blank for conducting oral examinations was recommended and a committee was appointed to work out uniform blanks.

The meeting went on record as favoring elimination of the clause in the model registration law that exempts engineers of long experience from examination for a license and proposed requiring graduates of engineering schools to submit to a written examination. Elimination from the model law of all reference to the National Council of State Boards of Engineering Examiners and the National Bureau of Engineering Registration was called for.

• • •

Pittsburgh Engineers Fight Unlicensed Official

An attempt to remove J. Frederick Triggs from his position as chief engineer of the Pittsburgh Planning Commission was initiated May 12 by the Pittsburgh chapter of the Pennsylvania Society of Professional Engineers. The chapter filed a complaint that Triggs was practicing without a license.

Triggs stated that he did not have an engineer's license because he could not meet the experience qualification. He said, however, that he had pending an application for a surveyor's license and that this was sufficient to permit him to hold his city position.

THE CURRENT TREND

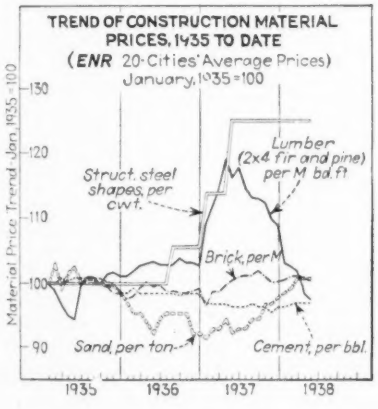
This week's news of contract volume and construction cost factors

Material Cost Trends Mixed

Sand, brick and steel prices above January, 1935 prices, lumber and cement lower

Comparison of current *ENR* 20-cities' average prices of four construction materials with January, 1935 prices, shows sand and brick up 0.8 and 0.4 per cent, respectively, while lumber is 2.6 per cent lower, and cement 3.0 per cent lower. These materials are fairly close to their 1935 levels, but the structural steel shapes price, f.o.b. Pittsburgh, is 25 per cent above its January, 1935 price.

Structural steel remained at its 1935 price level until the middle of 1936, then increased 5.5 per cent. In the first quarter of 1937 it climbed to 13.8 per cent above the 1935 price, and in the second quarter of 1937 reached its present level.



Cement prices based on January 1935=100 remained fairly constant over the period from 1935 to date, with a range of 5.3 per cent between the high of 100.8 reported in the middle months of 1935, and the low of 95.5 reported in November, 1937. The current 20-cities' average price, $2.55, unchanged in the past three months, is 0.8 per cent above the 1937 average price, 1.5 per cent below the 1936 average, and 3.4 per cent under the 1935 average price.

Brick's 20-cities' average price based on January, 1935=100 also remained fairly level. Its high was 101.9 in September, 1937, and its low 96.5 in January, 1937. The present 20-cities' average price, $14.14 per M, is 0.4 per cent above the 1937 average and 0.7 per cent above the 1935 average price.

Sand prices reached their peak of 103.2 for the three-year period in February, 1935, and their low of 91.4 in January, 1937. Currently sand is running 7.7 per cent above last year's average price, and 0.8 per cent above the 1935 20-cities' average price.

Lumber price, the 20-cities' average for 2x4 fir and pine, based on January, 1935=100, ranged from its high, 118.9 in April, 1937 to its low of 94.2 in May, 1935. Strikes raised prices in the beginning of 1937. From June, 1937, to the present time prices have dropped 17 per cent to a level 2.6 per cent below the January, 1935 20-cities' average.

Building Permits

Building permit values for April, $84,842,365, are 10.8 per cent above March, but 27.8 per cent lower than April, 1937, according to Dun and Bradstreet reports from 215 cities. April permits in New York City, $16,197,699, are 41.8 per cent above March, but a drop of 40.3 per cent from last April.

All sections of the country, except New England, share in the April gains over March, but only South Central reports a gain over April, 1937.

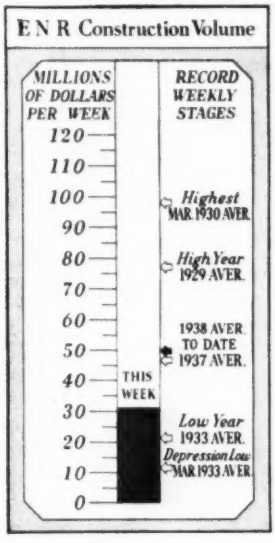
Building permits for 1938 to date, $362,317,610, are 7.8 per cent below the $393,059,326 reported for the corresponding period a year ago.

Business Briefs

PREPARED ROOFING SHIPMENTS in March, 4,520,563 squares, are 97.7 per cent above February, 1938, and 93.2 per cent above March, 1937 according to the Bureau of Census. Shipments for the first quarter of 1938, 8,639,151 squares, are 4.0 per cent above the corresponding 1937 quarter.

CONCRETE PAVEMENT YARDAGE awards in April, 4,283,813 sq. yds., are 1.2 per cent below April, 1937 as reported by Portland Cement Association. Road yardage is 3.5 per cent below last April, while street and alley yardage awards are 4.5 per cent and 26.0 per cent, respectively, above a year ago. For the 4 months of 1938, total yardage is 22.3 per cent below the corresponding period in 1937. Reported totals are:

	Square Yards Awarded April 1938	1937 4 months	1938 4 months
Roads	3,039,280	10,010,748	7,247,330
Streets	1,218,931	3,375,596	3,067,892
Alleys	25,602	61,664	134,568
Total	4,283,813	13,448,006	10,449,790



THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending May 27 1937	May 19 1938	May 26 1938
Federal	$2,619	$1,421	$1,697
State & Municipal	25,069	21,820	22,618
Total public	$27,688	$23,241	$24,315
Total private	29,928	17,373	8,535
TOTALS	$57,616	$45,614	$32,850

Cumulative
1938 (21 weeks) $1,031,865
1937 (21 weeks) $971,029

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000.. other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

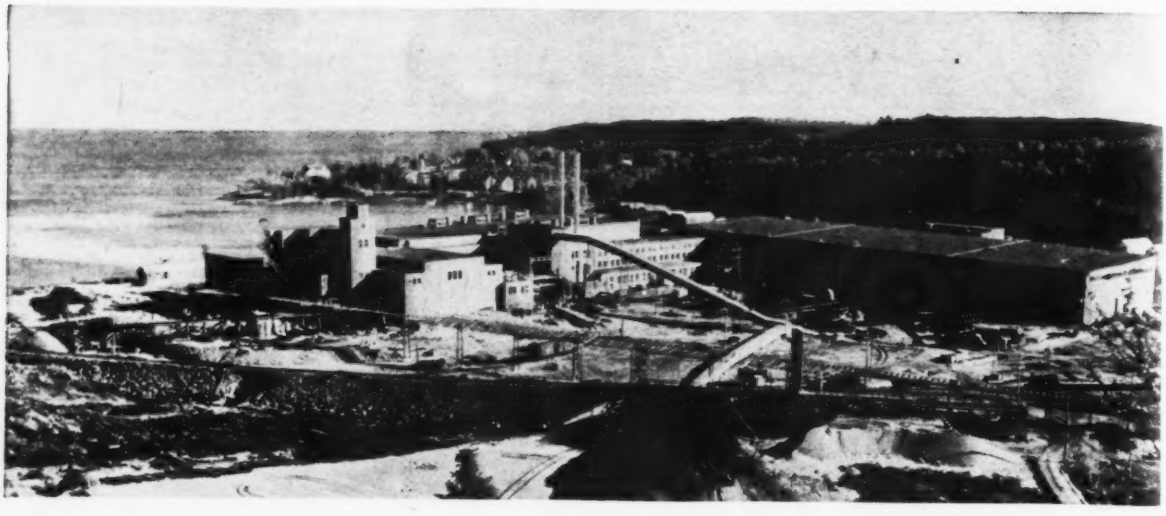
	Cumulative 1937 21 Wk.	1938 21 Wk.
NON-FEDERAL	$557,821	$478,374
State & Mun. bonds	225,206	239,555
Corporate securities	253,561	119,690
PWA loans, grants	49,025	2,036
RFC loans	29,939	63,670
U.S.H.A. loans	.....	53,493
FEDERAL	.....	$86,532
TOTAL CAPITAL	$557,821	$564,886

F H A MORTGAGES

	Cumulative 1937 20 Wk.	1938 20 Wk.
Mortg. selected for appraisal	$264,434	$328,777

ENR INDEX NUMBERS

Index Base	1913	1926
Construction Cost (May)	236.80	113.83
Building Cost (May)	197.86	106.95
Construction Volume (Apr.)	176.00	77.00



NEWSPRINT PLANT COMPLETED IN NORTHERN CANADA

ONE OF THE LARGEST construction projects in Canada in recent years, the new paper mill plant of the Ontario Paper Co. Ltd., has recently been completed at Baie Comeau on the isolated north shore of the St. Lawrence River in Quebec. It will be officially opened next month. During the winter months the site is accessible only by air. Power is from Outardes hydro-electric plant.

The mill, which is to supply newsprint for the New York *Daily News*, has a capacity of 350 tons daily. The Foundation Co. of Canada, Ltd. was the general contractor on the project.

Utility Will Sell To TVA and City

Officials of the National Power & Light Co., Electric Bond & Share subsidiary, voted on May 19 to accept the joint offer of the city of Knoxville and the TVA to purchase the electric properties of the Tennessee Public Service Co., a subsidiary of National Power & Light.

The price finally agreed upon, however, was $7,900,000, $400,000 more than the offer made last week by the public bodies.

The distribution system within the city of Knoxville is to be bought by the city, and the TVA will buy the company's transmission lines.

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Design Restrictions On Possum Kingdom

continued from page 729

Lytle Co. and Al Johnson Construction Co. on a joint bid of $3,287,000.

The project has had a somewhat checkered history. The district originally received a WPA allotment of $3,100,000 on a finding by the U. S. Engineers that this would cover the cost of construction. Further investigation of the foundations led the army engineers to increase their estimate of the cost to $6,600,000 and the WPA allotment was held up.

The engineers of the Brazos district disagreed with the new cost figure, and the Bureau of Reclamation was called in to make an independent estimate of the cost of the work.

On the basis of the bureau's estimate, a WPA allotment of $4,500,000 was made to the district, conditional upon an assurance that the district would meet any additional cost which might arise. This allotment was approved by the President last December.

• • •

Sydney Bridge Builder Dies in London

Lawrence Ennis, managing director until a year ago of the British construction firm of Dorman Long & Co., who was engineer in charge of construction of the Sydney Harbor Bridge in Australia, died in London, May 6, at the age of 66.

Ennis had his first professional experience in this country, as an assistant engineer for the Rochester Bridge & Iron Works in 1890. Twelve years later he took a similar position with the Baltimore Bridge & Iron Works, and in 1903 he joined Dorman Long as superintendent. He became general manager of the firm in 1913 and managing director in 1932.

The years from 1924 to 1932, Ennis spent in Australia on the Sydney Harbor Bridge project, on which Dorman Long held the contract.

Upon the completion of the bridge in 1932, Ennis returned to England and was made managing director of Dorman Long. He held that post until May of last year when he retired.

Most Highway Traffic Goes Short Distance

Fewer than two out of every 100 vehicles on the nation's highways are traveling more than 100 miles to their destinations, according to preliminary figures made public by the U. S. Bureau of Public Roads from the national road survey now being conducted by the bureau in cooperation with 43 states. The present figures are from an analysis of results obtained in eleven states.

The preliminary survey showed that main highways, with their extensions through cities, now carry about 58.9 per cent of the total motor-vehicle traffic; 30.8 per cent is on other city streets; and hardly more than 10 per cent is carried by secondary and local rural roads, although these latter have eight times the mileage of the main highways.

Data from 17 states show motor traffic on main highways and trans-city routes to be 58 per cent urban and 42 per cent rural in origin.

The bureau anticipates that the data collected in the planning survey, will furnish clear cut indications as to what should be done in further road construction. It is also expected that this data will give definite information as to the relative transportation service that may be afforded by improving different classes of roadways, as well as to who is to benefit, and lastly, who should be called upon to pay the cost of building.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

ATTEMPTS by applicants for PWA allotments to obtain special favors by submitting their applications through unusual channels were stated last week to be entirely useless by Administrator Ickes. "As a result of local controversies or political conflict in many areas sometimes incident to primary campaigns," Ickes said, "it has been called to my attention that public misinformation is being given out to the effect that PWA projects may only receive approval if presented to the Public Works Administration through certain channels of which no mention is made in federal law.

"This misinformation is false. . . .

"The only thing that PWA will pay attention to in any way is the official application. . . ."

EXEMPTION of publicly-owned interstate bridges from local taxation is decreed in a bill passed by the Senate on May 19 and sent to the House. The exemption applies both to free bridges and to toll bridges on which all revenues are applied to operation, maintenance and amortization. Although of general application, the bill is specifically aimed at Ohio River bridges built by the state of Kentucky upon which the state of Indiana has at various times considered levying taxes.

THE U.S. SUPREME COURT on May 23 declined to review a lower court decision dismissing the attempt of three utility companies to enjoin a PWA allotment of $6,000,000 for the Santee-Cooper development.

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Port Authority Salaries Taxable

continued from page 729

In the present case, the court held, the tax "could by no reasonable probability be considered to preclude the performance of the functions which New York and New Jersey have undertaken, or to obstruct it more than like private enterprises are obstructed by our taxing system. Even though, to some unascertainable extent, the tax deprives the states of the advantage of paying less than the standard rates for the services which they engage, it does not curtail any of those functions which have been thought . . . essential to their continued existence as states."

Immunity from taxation in this case would only "secure to the states a theoretical advantage so speculative in its character and measurements as to be unsubstantial. A tax immunity devised for protection of the states as governmental entities cannot be pressed so far . . . When immunity is claimed from a tax laid on private persons, it must clearly appear that the burden upon the state function is actual and substantial, not conjectural."

The Brush case

The court held that the case of *Brush vs. Commissioner*, decided last year, in which the salary of an employee of the New York City Board of Water Supply was held immune from taxation, does not establish a precedent in the present case. The federal revenue act applicable at that time specifically exempted payments for services rendered "in connection with the exercise of essential governmental functions of the state." The only question at issue in that case was whether water supply was an essential function.

The revenue act, however, was amended last January to exempt only conpensation derived "from the state as an officer or employee thereof . . . and immune from taxation under the Constitution of the United States."

• • •

New York Board Is Sued On Aqueduct Contract

The action of the New York City Board of Water Supply in awarding Contract 324 of the Delaware aqueduct to the second low bidder on May 9 (*ENR*, May 12, 1938, p. 665) has resulted in a suit seeking an injunction against consummation of the contract. The low bidders, Arthur A. Johnson Corp. and Necaro Co., Inc., brought suit in the New York Supreme Court and charged that the Board of Water Supply had arranged a deal among certain contractors who have brough suit for damages against the board.

The controversy arose out of the cancellation of awards on three sections of the aqueduct last October. The awards were cancelled after protest had been aroused by the wage rates established as prevailing.

A new schedule of wage rates was drawn up and contracts were re-let early this month. On the second letting, however, none of the companies which were low the first time made low bids. Contract 324, however, was awarded to S. A. Healy Co. on its bid of $10,985,000, although Johnson-Necaro had bid $10,870,000. The board explained its action on the grounds that the three low bidders on the original letting had agreed to drop damage suits amounting to $4,471,000 if the contract were awarded to Healy.

First Salmon Pass Bonneville Dam

Fish locks and fish ladders function successfully at first trial since dam went into operation

The first heavy run of salmon on the Columbia River is successfully negotiating the $6,500,000 fishways at Bonneville Dam, Secretary of Commerce Roper announced May 18. Official counts showed about 2,000 salmon passing the dam via the fish ladders on May 9, and nearly 3,000 on May 10. Commercial fishermen have already taken more than 12,000 salmon above Bonneville.

Commercial catches in the Columbia River this year have been lower than usual, but officials of the U. S. Bureau of Fisheries say that the dam is not responsible for the small size of the early runs of fish. They point out that the condition occurs downstream as well as upstream from the dam and that in the 40-mile strip immediately below the dam, the catch for the first week in May was about one-third of that in 1931, an average year.

On May 7, when the official counting stations were opened, salmon were finding the ladder entrances readily and ascending at the rate of 100 an hour. No indication of congestion or delay below the dam was observed.

The Bonneville fishways as now constructed consist of four fish ladders, about the width of a four-lane highway, three sets of double fish locks similar to navigation locks, three passes for finger-length salmon migrating downstream, and a system of collecting traps through which the fish will pass to the ladders or locks.

The counting stations, installed to check the efficiency of the fishways, consist of picket fences placed across the ladders near the upper end. Three gate openings are provided at the barriers, each opening 2 ft. wide. A white platform is placed under the water immediately below each opening to make the fish visible, and the fish are counted as they pass through.

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Contract Let for Work On Washington Bridge

Contract for improvements to the New York approaches of the George Washington bridge and for completing the New York anchorage by adding a rubble masonry and cut stone facing to the New York anchorage has been awarded by the Port of New York Authority to the Walter Kidde Constructors, Inc., on its low bid of $1,111,000.

Contractors Demand Revision of WPA

Use of relief labor on work other than construction advocated by A.G.C. at Spring Meeting

Immediate revision of WPA policies to take the government out of competition with construction contractors was demanded at the spring board meeting of the Associated General Contractors at French Lick, Ind., last week. The demand came in the form of a resolution endorsing in principle the objections and recommendations to the Works Progress Administration adopted by the Wisconsin Construction Industries Advisory Council. Other high spots of the three-day meeting were a report of activities of the association since the annual convention in February, presented by Managing Director Edward J. Harding; plans for an immediate nationwide protest against the Senate's reduction of the House appropriations for 1940-1941 federal aid for highways; and discussion of labor relations, social security and unemployment taxes and the WPA-contract plan of highway building now being tried out in New Jersey. About 80 contractors and chapter secretaries attended the meeting. Kansas City, Mo., was selected for the fall board meeting.

Wisconsin plan endorsed

The Wisconsin Construction Industries Advisory Council plan, formulated by 39 associations and construction groups throughout the state, lists fourteen points of objections to the present WPA policies, including economic waste in the work done, burdening of communities with excessive maintenance costs for a long time to come, and competition with private industry. Recommendations of the council include prohibition of WPA on projects normally done by local communities, revival of PWA projects on a scale that will absorb the unemployed *construction* workers, the adoption of a plan whereby unemployed workers in other industries would be taken care of by WPA projects within those industries and not dumped onto construction, and the setting up of labor pools from which workers not identified with major industries would be drawn for work on park development, soil conservation, and reforestation.

A drive for restoration of the Senate cuts in the 1940-1941 federal highway aid will be made by local chapters throughout the country, directed at the conference committee to which Congress has delegated consideration of the highway bill.

In an effort to encourage private building construction through the insured mortgage plan of the FHA, the A.G.C. has cooperated with the federal authority by conducting an educational campaign from coast to coast. Officers and staff members from national headquarters have conducted meetings in each state attended by those interested in construction. From these large meetings local campaigns have sprung, conducted by A.G.C. chapter officers and secretaries. Results have been gratifying and the outlook for considerable private construction from this source is reported as good.

Labor relations

National headquarters of the A.G.C., thrown into the turmoil of labor relations for the first time by action taken at the fall board meeting last year, has continued to gather data from all chapters and branches, acting in a central advisory capacity and as a clearing house for labor information. The various chapters are free to act as they choose in labor relations providing they do not bind other chapters or the national association.

Great concern was expressed at the meeting over the coming plan of merit or debit rating charges on the unemployment insurance tax rate. Contractors feel they will be unjustly penalized by such a plan, for the very nature of their business precludes much continuity of employment and in addition they are prohibited by legal and other restrictions from moving their labor from one locality to another. Wisconsin already is applying the debit rating, and other states have announced intention to follow suit as soon as the necessary legislation can be passed.

Contract WPA work

There was considerable and violent discussion of the so-called New Jersey plan of contract use of WPA labor. Under this plan the state highway department awards contracts and controls the operations, though WPA supplies the labor. Materials are supplied by WPA, or the contractor, or both, the exact distribution being clearly stated in the contract. The contractor always supplies the plant and equipment, equipment operators, small tools and the necessary supervision. The state sets up a schedule of the man-hours of labor that must be used for each contract item. So far fourteen such contracts have been let, aggregating $1,300,000. Some of those present at the meeting denounced the plan as perpetuating the WPA; others felt that it was making the best of a bad situation. The plan was neither condemned or endorsed.

At a joint dinner meeting of the A.G.C. and American Association of State Highway Officials cooperative committee, H. K. Bishop, chief of the construction division, U. S. Bureau of Public Roads, pleased the contractors by admitting many of the contract provisions in state and federal specifications were unjust to the contractor.

Bureau of Reclamation

NIGHT WORK AT MARSHALL FORD

DAY AND NIGHT work is being pushed forward on the Marshall Ford Dam on the Colorado River in Texas. Work began on the 190-ft. flood control and water conservation structure about a year ago, concreting started in November, and the project is now 45 per cent complete.

Few Bids Received On Cement

No bids in one area, one in another, and small numbers in three others are received

The Procurement Division of the Treasury met the first check to its revised plan for centralized purchasing of cement May 17 and 18 when it received bids on cement to be used by federal agencies in six different regions.

No bids at all were received on a request for 17,500 barrels of portland cement and 12,000 barrels of moderate heat cement to be used in Ohio and West Virginia. Moreover, only one bid was received, and that from a dealer, on a request for 5,500 barrels of cement to be used in New Jersey. Here, the Harrison Supply Co. of East Newark, offered to furnish 4,000 barrels at a number of storage points.

Two identical bids were received in the Oregon region, two competitive bids in Utah, and three bids, of which the two low ones were identical, in Colorado and Texas.

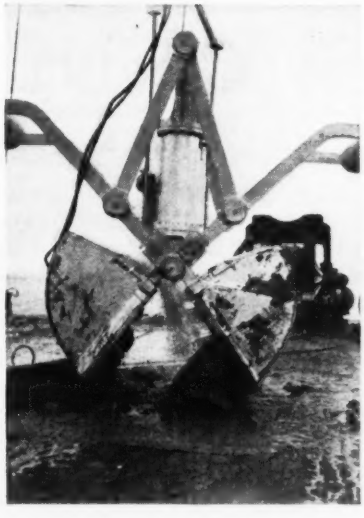
Contract conditions

In general, the contract conditions set up in the various bid calls follow those in the successful California letting (*ENR*, May 5, 1938, p. 633; May 19, p. 703). A new feature was introduced in an offer to accept bids f.o.b. point of storage as well as f.o.b. mill.

The Treasury has stated that when an award is made the mill will be called on to deliver the full quantity specified, that contracts rather than options are being awarded. Some cement manufacturers have drawn attention, however, to the possibility that it may not be possible to carry out this policy. The Riverside Cement Co., third low bidder in the California letting, made its bid conditional on approval of the terms by the Comptroller-General. The company pointed out that the Comptroller has held in the past that government purchases must be made at the lowest price at the point of delivery and that this might interfere with consummation of the new type of mill-price contract.

Delivery terms

Other features of the terms vary in the bid calls of the different states. In some cases delivery is to be made over a period of several months, in others over only three weeks. The procedure followed is for the government, in the bid call, to state that delivery will start at about some specified date and will continue, as called for, at a rate not to exceed a specified maximum per week or per month.



UP FROM SEA BOTTOM

MATERIAL from the sea bottom 700 ft. below the surface of the Pacific Ocean near Monterey, Calif., is being dumped from the bucket above. This deep dredging was done last week during tests of a new type of dredge bucket invented by John C. Williams of Oakland, Calif.

Closing of the bucket is powered by water pressure on the ocean bottom. Only a single hoisting cable is required on the bucket. When the bucket touches bottom, the slackening of the cable releases a weighted lever arm which actuates a valve admitting sea water to two cylinders and moving their pistons. Air forced out of the cylinders is compressed into a special chamber. When the hoisting cable is tightened, the valve is closed again, thus retaining pressure in the cylinder to hold the bucket shut.

Polson Dam License Limits Lake Lowering

The Federal Power Commission has amended the license which it granted for the recently completed Polson Dam on the Flathead River in Montana in order to permit the commission to wait until after commercial operation begins before making a final determination of the limits within which the Rocky Mountain Power Co. may regulate the pool level of Flathead Lake. The original license provided that the final determination be made before commercial operation is started.

The amended license requires the company to maintain the level of Flathead Lake between El. 2,883 and 2,893 and provides that the final determination of lake level shall be such as to make at least 1,100,000 acre-ft. of storage capacity available for commercial operation.

Falls View Bridge Put Under Way

Railway company and Canadian and American governments act independently to replace bridge

Replacement of the Falls View Bridge over the Niagara River which was taken out by ice last January moved forward last week on three fronts. In the face of a rather confused legal situation, the International Railway Co. let contracts for preliminary excavation on the Canadian side of the river to the Robertson Construction Co. and on the American side to Wright & Kremers, Inc. Robertson started work May 20.

Ten days earlier, however, the Canadian House of Commons passed the Niagara Bridge Bill and sent it to the Senate, where early passage is expected. The bill establishes a corporation to build the Canadian end of a proposed bridge; an American company would handle the American end. The incorporators of the Canadian company have already assigned their rights to the Ontario government, and Canadian portion would revert to the province when bonds were retired.

A third factor was introduced into the situation May 16 when Representative Andrews introduced into the American House of Representatives a bill authorizing a Niagara Bridge Commission, to be appointed by the governor of New York. The commission would have power to build a bridge and to take over the existing bridges. Andrews contends that an act of Congress would be necessary before International Railway can build.

Immediately after the failure of the old Falls View Bridge Jan. 28, International Railway engaged the Montreal firm of Monsarrat & Pratley and the New York firm of Modjeski & Masters as consulants. The structure now planned will be a $1,500,000 arch with foundations 50 ft. farther inland on each side and about 20 ft. higher than those of the old bridge in order to avoid danger from ice.

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Misrepresentation Charged On Concrete Vibrator

A formal complaint charging violation of the Federal Trade Commission Act was entered last month against the Mall Tool Co. of Chicago, manufacturer of concrete vibrators. The Federal Trade Commission charged the Mall Co. with passing off a 2-hp. product manufactured by another company as a 3-hp. product manufactured by Mall.

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

From an Engineer's Diary

Sir: I enclose a clipping from a recent issue of the London Times, describing the pageantry of laying the foundation stone of London Bridge more than 100 years ago.

The completion of the first coffer-dam of the new Waterloo Bridge tempts me to send the following extract from my grandfather's (William Lewin, C.E., one of the engineers of London Bridge) diary regarding the laying of the foundation-stone of London Bridge:—

"Wednesday, 15 June, 1825. I went to London Bridge this day to attend Mr. Rennie during the ceremony of laying the first stone. Messrs. Leslie, Lewin, Knight, & Morris were there. The whole of the inside of the dam was fitted up like an amphitheatre [here follows a drawing] with seats covered with scarlet cloth, the bottom covered with ditto, and an awning fixed over the top. The eight master operatives were all dressed in blue coats having buttons with L.B. on them, yellow waistcoats with ditto, purple cravats, white trousers, and straw hats, having six journeymen attendants dressed in blue jackets and brown trousers and black chip hats. Rennie and attendants dressed in blue coats, white waistcoats, and white trousers.

"About four o'clock the Lord Mayor, attended by the Duke of York, Aldermen and Common Council, and all the officers belonging to the City of London, descended into the bottom and went through the usual ceremony, putting coins of the present reign under the stone, which was covered with a brass plate, and the stone weighing about four tons cramped down and well screwed over them. It was an Aberdeen stone. A very fine stone was worked at Southwark Bridge which measured as much as both the other stones but was not set, it not being there in time. After the ceremony was over we dined at the City of London Tavern. There were upwards of 2,000 people in the dam. London Bridge was stopped six hours and the Southwark Bridge opened free of toll."

It is to be wondered whether Mr. Harbert Morrison will stage so picturesque a ceremony in connexion with the new Waterloo Bridge.

In view of the lavish expenditures of public funds today, it would add much to public satisfaction if we would stage a little of the pageantry in which the British are such past masters. Take the Golden Gate bridge or the Hudson River tunnel for example. What nationwide interest would have been excited by commencement ceremonies with the engineers and construction men attired in blue swallowtail coats, yellow waistcoats, white trousers, and purple neckties! And not the least interesting part would have been to have listened to the foremen's language when they got by themselves afterwards.

DAVID A. WATT
May 9, 1938, St. Petersburg, Fla.

Grout Capping

Sir: Occasionally we hear discussions relative to the advisability of using so-called "excessive" bearing values for ordinary grout. During a recent "failure" test of an assortment of 33 bearing piles observed by the undersigned, the grout "capping" of several 10-in. pipe piles, 110 ft. in length, was repeatedly subjected to a maximum stress of 400 tons (approx. 10,000 lbs. per sq.in.) with no visible evidence of crushing or cracking.

The grout cap was about ⅜ inch thick and was composed of equal parts of cement and sand.

MANLEY STEGEMAN
Structural Engineer
Detroit, Michigan, May 17, 1938

Beam Shear and Net Area

As originally published in the May 12 issue this letter had several paragraphs interchanged due to a printer's error in makeup. It is presented correctly below. — EDITOR

Sir: Referring to the interesting article on beam shear, by Messrs. Mount and Welch, (*ENR*, April 14, 1938, p. 546), may I point out in further support of their conclusions 4, 5 and 6, that no less an engineer than the late Gustav Lindenthal contended that rivet shanks cannot be correctly assumed to fill the holes (*Trans.* Am. Soc. C. E., Vol. 83, p. 1635), and designed the compression members of as important a bridge as the Hell Gate arch on the basis of net section. (*Trans.* Am. Soc. C. E., Vol. 82, p. 914). It is recognized and admitted, furthermore, by those who have had experience in driving long rivets, such as those in the gusset plates of heavy trusses, in the splice plates of long columns, and in thick flanges of heavy plate girders, that long rivets do not completely fill the holes. The writer has found that this was also true of short rivets as he has had some undoubtedly tight rivets of short grip cut out, both machine driven, field driven by expert bridgemen, and shop driven with a gun, and can say that none of shanks of these rivets completely filled the hole, and that all were coated more or less with scale.

The use of steel plugs having a driving fit does not duplicate the effect of rivet shanks, as such plugs will fill the holes more completely than rivets, and the writer would suggest that in any future experiments the effect of rivet shanks could be more nearly duplicated by driving rivets through the web, with washers on each side, and cutting off the heads, leaving the shanks in place.

In the discussion by Mr. Lindenthal cited above, it is pointed out that if the scale on the shank were only 0.0005 in. thick, the adjacent steel would have to compress 0.001 in. to bring the parts in contact, assuming that the scale would crush readily. To deform the steel 0.001 in. per in. would require a unit stress of 30,000 lb. The writer has examined many cut out rivets, and has yet to see one that did not have some scale on the shank. The effect of scale is practically negligible, however, when cooling shrinkage is considered.

Assuming that the temperature of a rivet shank is at least 1500 deg. F. when fully driven and that the shank of a rivet is so perfectly upset as to fill completely a 15/16 in. diameter hole, the shank will shrink about 0.009 in. in cooling. This will be increased by the reduction of diameter (Poisson's ratio effect) caused by cooling strain parallel to the grip. In order to close the gap between the rivet and the hole, the adjacent steel would then have to be stressed beyond the yield point, as a deformation of only 0.001 in. would stress the metal to 33,000 lb. per sq. in.

Although the writer regards the assumption that rivets fill the holes as a rather convenient fiction, he does not by any means believe that existing unit-stress and design formulas can be applied to net sections without revision. A comprehensive

review of column test data on the basis of net section (and also on the basis of the thickness of the metal used, which is another matter), would probably add considerably to our knowledge of columns. Concerning the flexural design of plate girders, the writer believes that the use of gross section is more nearly correct than net section for computing the unit stress between cover plate rivets, but that an appropriate formula should be devised for computing the average increase in stress through the rivet holes. This opinion is based on analysis of deflection measurements made on a large number of railway girder spans.

Concerning beam and girder webs, the writer shares the opinion of other engineers that they are much stronger than our current approximate method of design indicates. This opinion is based on inspection and office check of many existing railway girder spans now carrying much heavier loads than those for which they were designed. The problem is not as simple as merely dividing the net reaction by the web area, and probably would be better answered in terms of diagonal tension and compression. However, since the average vertical unit shear will probably continue to be used for some time as the criterion of web strength, consideration should be given to increasing the allowed unit stress and using the net section of the web, as indicated in the article under discussion.

THEODORE DOLL
Structural Engineer
Chicago, April 22, 1938

Special Concrete Coating

The special concrete protective material referred to on page 659 of our issue of May 5 is known as "Amercoat". The name was incorrectly given in the May 5 issue.

Statue or Statute?

For the benefit of our readers who were confused by the "62-ton statute" described in our issue of May 12, it should be stated that the item in question described a perfectly good statue when the news item was set up in 9 pt. type for the news pages. Subsequently, however, the news item was taken to fill out page 688 in the mainsheet and was sent to the printer attached to the page with instructions that it be reset in the larger type of that page. The compositor's mistake was not discovered until the issue had been printed.

More About Panama

Sir: I am in complete accord with Mr. Smith's final conclusion in his letter of April 24 (*ENR* May 12, p. 672), i.e., "Of course any enemy nation that obtains control of the sea over us would land an invading force at either or both canals (Panama or Nicaragua) which is a good argument for a navy strong enough to meet any possible combination of forces that can be brought against us." I am also in accord with Mr. Smith's opposition to building a canal at Nicaragua, but I still insist that the construction of a sea-level canal at Panama is just as impracticable today as it was 30 years ago when the minority report of the Board of Consulting Engineers recommending a lock canal prevailed. Page 186 of that report contains a table showing 25 tributary streams, cut by the canal, with natural cascades ranging from 15 ft. to 195 ft. in height and floodflows aggregating 26,000 sec.-ft. The report concludes, "A simple inspection of this table will convince any engineer that a canal subject to such interruptions could neither be navigated by ocean shipping nor maintained at any reasonable cost. Diversion channels over 40 mi. in length, paralleling the canal and demanding heavy cuts and probably tunnels and auxiliary dams, to say nothing of levees, must be contemplated. With a summit level of 65 ft. (constructed to 85 ft.) a lock canal will be subject to no such difficulties, as nearly all of the affluents will be absorbed naturally in Lake Bohio (Gatun Lake)." Madden Dam, recently constructed, could not possibly "keep the flow of this river either entirely diverted from the canal or allowed to enter in a way that would not create strong currents," as Mr. Smith suggests. It was built for summit-level storage and for power and is also vulnerable to air attack, but its complete destruction would not be so damaging to a lock-level canal as it would to a sea-level canal. As for flattening the slopes in Culebra Cut to make them bomb proof, I am willing to refer that suggestion to Brigadier General Clarence F. Ridley, Governor of the Canal Zone. Congress passed the big navy bill yesterday, with some modifications, so Mr. Smith and I can calm our fears and agree that we don't want another canal at Nicaragua.

I agree with Mr. Durham (*ENR* May 19, p. 705) that enough study has been given to the canal question in the past century to obviate the necessity of making guesses on the subject, but I think that he guessed wrong about Madden Dam if he thinks it was built to control the flood waters of the Chagres.

Madden dam, as noted previously, was built to store water for the low water supply of the summit level of the canal and to generate power for use at the canal locks. The storage basin above it has not sufficient storage capacity for complete flood control and it is not necessary for that purpose because Gatun Lake and spillway are entirely adequate for that purpose.

As to the necessity for a tide lock in a sea-level canal at Panama, the Board of Consulting Engineers said, "It is probable that in the absence of a tidal lock the tidal currents during extreme oscillations would reach five miles per hour. While it might be possible to devise facilities which would permit ships of large size to enter or leave the canal during the existence of such currents, the board has considered it advisable to contemplate and estimate for twin tidal locks near Sosa Hill." Of course the board was only "making guesses on the subject."

ROBERT ISHAM RANDOLPH
Structural Engineer
Detroit, Michigan, May 17, 1938

Curbs on Bridges

Sir: Commenting on a skidding accident on the Dover St. Bridge, the *Boston Globe* said recently: "Of course the drivers of cars should be more careful. When speed becomes a factor in skidding the danger is greatly increased, but it would seem that the surfaces do not hold the tires as they should. A careful survey of the situation is in order." This is pertinent comment. Would not a study of rails and curbs on bridges be appropriate for discussion in your paper, as well as non-skidding pavements?

BURTIS BROWN
Boston, Mass., May 17, 1938

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MAY 26, 1938

DETERMINED ATTACK on the tragic evil of railway-highway grade crossings has been one of the brightest features of public-works administration under the recovery program of the past five years. Congress made generous provision for the construction of over- and undercrossings, and many hundreds of danger points have been wiped out through these means. Is the public now relaxing its determination to deal with the evil? From the details of the highway authorization now pending in Congress, as reported in our news pages, it will be seen that the grade-crossing item is heavily reduced over that appropriated for the last two years. Economy cannot be the motive, for at the same moment the government is busily seeking ways to spend some billions of dollars in order to revive lagging industry and employment. Reduction of the grade-crossing appropriation therefore can be chargeable only to Congressional lack of interest in safety of life. All the conditions call for expanding instead of curtailing the grade-crossing program, and it is to be hoped that the succeeding Congress will give more thoughtful consideration to the day's real needs than is apparent from the present cut in grade-crossing funds.

Progress in Dams

EARTHFILL AND ROCKFILL dams become constantly more notable for elaborate underground structure. The Algerian rockfill dams described on a following page are recent examples; in all of them the structures provided for underfill control of water are comparable in dimension and complexity with those that are visible above the surface. In fact the laid rockfill itself, though quite unusual, is hardly a more unique development in dam practice than is the filter-bed drainage system designed by Dr. Karl Terzaghi for the dam at Bu Hanifia (see our earlier comment, ENR Dec. 2, 1937, p. 889). Depth and volume of grouting in the porous and unsound foundation rocks also approached the maxima of modern practice. Remembering that during long ages the dam-builder's first concern has been to find good foundation, it is an indication of progress that greater freedom in location is now coming about by virtue of methods and machines which enable the dam-builder to remake the earth so as to provide a foundation at the chosen location.

Leadership Succeeds

MOST HIGHWAY OFFICIALS who read the article in this issue by the director of highways for the state of Washington will envy his freedom from a multiplicity of road laws. Perhaps also they may gather courage to do what the Washington officials did. The state's highway code is virtually the creation of its highway department. Though the department officials obtained advice and aid from many sources, it was they themselves who inspired action, prepared the laws, and sold the plan. Suggestions for legislation and advice on proposed legislation are the everyday work of highway departments, but stepping beyond this point to more creative effort was what produced for the state of Washington the first code of highway laws in the United States. The lesson is worth careful consideration: by assuming responsibility for leadership in reshaping the administration of a vital public-works activity the state's highway authorities achieved a result of great value. The lesson ought to be learned widely if engineering is to keep control of its heritage of the development of road transport in America.

True Economy

ATLANTA'S NEW sewage-disposal facilities do credit to the city that undertook the seven-million-dollar program and to the engineers and constructors who labored to provide the best that science and skill can provide. If equally creditable effort is applied to the operation of these facilities, the southern metropolis will find its sanitation truly modernized. Suggestions have been made—obviously by men uninformed on treatment plant requirements—that money might be saved by entrusting the operation of the system to unskilled forces. Were such a plan to be adopted Atlanta's citizens would soon bitterly regret the step. It is an unfortunate fact that many well-intentioned public officials consider sewage treatment to be about as simple as the operation of a cesspool. Even some enlightened citizens think that a treatment plant comprises nothing more than a concrete settling tank and a few pumps; they fail to realize that it performs a finely coordinated series of functions which require the attention of skilled technicians assisted by a thoroughly trained staff. Adequate operating appropriations represent true economy in the case of sanitation facilities. Accordingly, now that Atlanta has provided itself with an excellent disposal system it owes it to the health and pocketbook of its citizens to make equally modern provision for its operation.

Time for Drastic Action

THE REDUCTION by the Senate of authorized federal aid to roadbuilding puts a duty on state highway administrations that they have neglected: to take up the federal-aid money promptly and utilize it for highway improvement. This the states have not done, to the amount of $150,000,000 of appropriations already made! With these millions lying untouched the query is: Why pile on more millions to stagnate in turn? We have the answer in the Senate's decision.

Need we wonder at what happened? The danger has been evident for a long time. It has sounded in the rumblings of Congress for half a decade over dipping into the federal pocket to replace state highway funds diverted to other uses; it showed clearly in the federal-aid legislation of four years ago that put a penalty on state road-tax diversion, and in the reluctant enforcement of this penalty by the federal highway authorities; it broke into positive threat in the President's Congressional messages of last fall urging drastic retrenchment in federal appropriations for roads, and radical changes in federal-aid policy and practice. No one can fairly claim that the decision of the Senate comes without ample warning.

But, it will be argued, politics played a large part in the decision nevertheless. Perhaps so, but the argument is poor salve for a stubbed toe. Politics did play a large part, and a very cunning part, in the highway bill, as in a year of elections is quite likely to be the case. But the point is that politics found a logical and in fact undisputable argument to justify a reduction of federal aid, in the $150,000,000 of treasury dollars left idle by state inaction. If the states had taken up this money the seeming reasonableness of the Senate bill totals would have vanished.

As they go before the public these totals for the two fiscal years 1940 and 1941 read $472,500,000. Compared with the House bill which called for $476,000,000 the reduction by Senate action seems nominal. But the House total was money over and above the unused $150,000,000, which the Senate total includes. The reduction, amounting to $153,500,000, falls not alone on those states that failed to take up their money—which would be but due justice—but will fall on all states, both those that acted according to the spirit of federal aid and those that did not.

What can be done? Obviously nothing at the present time to alter current legislation. But definite action toward corrective measures is possible and is in order: First, study should be made to determine how the money that lagging states have not used and show no desire to use can be reallotted to the states that will use it. And, second, federal-aid legislation and practice should be revised to penalize diversion positively and more severely, and to reduce to not over a year after allocation the period during which any state can take up its allotment of federal aid.

Such action will be drastic. But drastic action is needed to cope with the freebootery and mendicancy of state officials and to return the federal highway aid system to basic principle.

Planned Flood-Control

THE FLOOD-CONTROL bill now before Congress has the merit of taking flood-control legislation out of the haphazard class and putting it along with legislation that has had advance study. There was good reason for much of the hasty legislation of the past few years; a series of abnormal floods had made the nation a bit jittery about possible future flood damage. Now that these floods can be viewed in their proper perspective there is no reason to rush into building flood works without proper study.

The new bill is based upon a reexamination of extensive studies of all major river basins made by the army engineers during the past ten or twelve years. Those studies, known as the 308 Reports, covered flood control, power and navigation, and laid down tentative, though all-inclusive, development programs for each river system in order to facilitate more detailed study of any element. Such detailed study has been in progress since Congress laid down a national policy in the flood-control act of 1936.

Dreamers have urged that the country be divided into seven or more regions under some sort of supergovernment like the TVA which would plan and execute flood control and similar regional river works. But fortunately Congress is not receptive to such pleadings. As the House Committee on Flood Control points out, too much of such planning consists of vague generalizations and lacks specific recommendations.

Further, regional bodies, no matter how able, take a regional view and so may call for an accelerated program that bears no proper relation to a balanced program of expenditures for the nation as a whole. The TVA is a good example. It has spent millions for structures like Wheeler, Pickwick and now Gilbertsville dams because they fitted into its program and the money could be obtained without question, but had these structures been weighed against the needs of other rivers it is doubtful whether they all would have been authorized for many years.

The time-honored way of having river development projects presented to Congress through a step-by-step study may be cumbersome, but it is far superior to any other method so far proposed. Congress does well to turn back to this method.

PICTURES IN THE NEWS

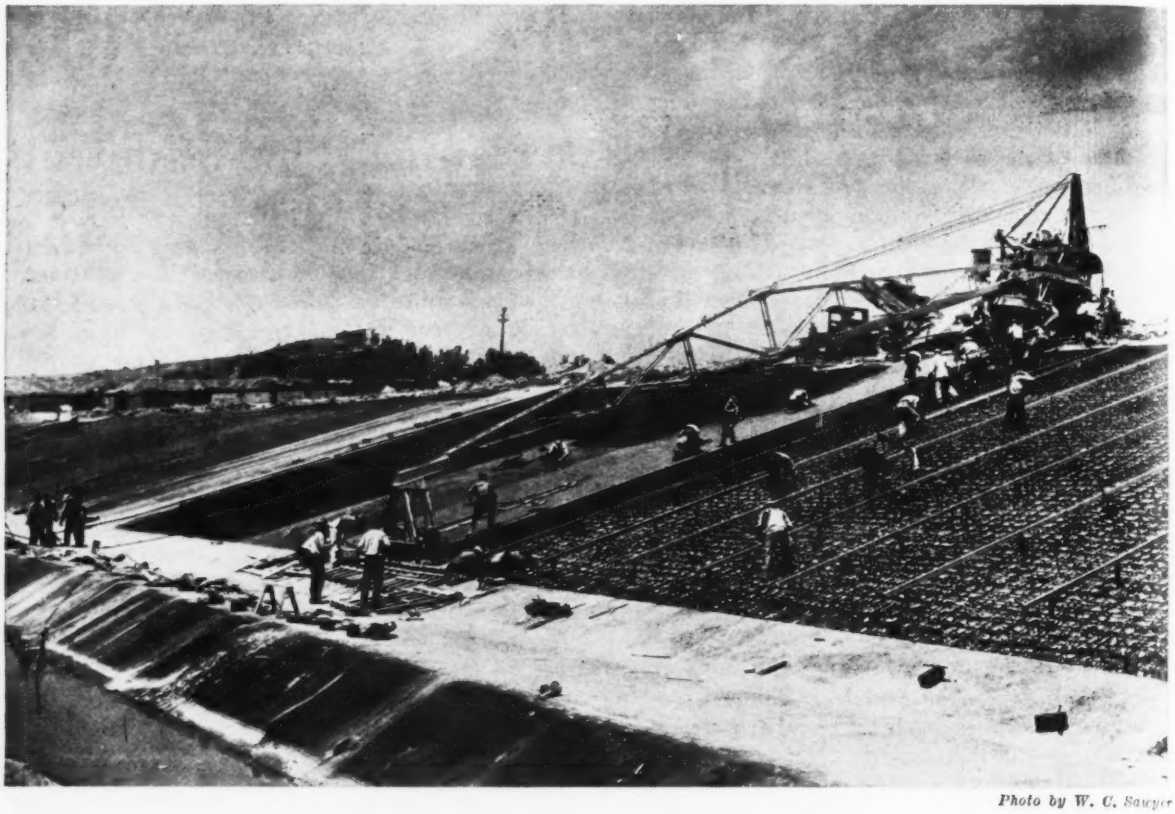


Photo by W. C. Sawyer

AFTER THE FLOOD at Los Angeles, U. S. Army Engineers decided to step up their Los Angeles River bank protection plans by substituting reinforced concrete for rubble masonry pavement at outer banks of heavy curves. Above is shown part of the concrete placing operations on a bank slope of 3 to 1.

Photo by C. G. Grover

WESTERN BRIDGE ENGINEERS meet at Salt Lake City to discuss bridge-strengthening specifications with Albin L. Gemeny, chairman of the A.A.S.H.O. bridge committee. F. W. Panhurst, California's chief bridge engineer, uses a magnifying glass to examine a western bridge photo, while Mr. Gemeny scans another, and R. A. Hoffman, bridge engineer of Arizona, and the western group's secretary, keeps his eye on the photographer.

Seven Million For Sewage Disposal

Atlanta, hub-city of the Southeast, is bringing to completion a sanitation improvement program involving five treatment plants and 80 miles of sewers

ALMOST THREE DECADES have elapsed since Atlanta—the first municipality to use Imhoff tanks in this country—made its initial installation of sewage treatment facilities. When the city built three Imhoff tank-trickling filter plants in the period 1910–14 it achieved distinction as one of the progressive municipalities that recognized the need for properly disposing of its sewage. But it soon lost this standing; the city went through a period of rapid growth, during which enlargement of disposal facilities did not keep pace, and the plants soon became badly overloaded. In fact, pollution of the streams that encircle the city reached the state where a one-time mayor was reported to have said, "Atlanta is an island practically surrounded by sewage."

Today, the situation is changed. Recently completed are four new disposal plants and a fifth one is ready to go under construction. In addition, some 80 miles of sewers are being laid as part of a sanitary improvement program the cost of which will be $7,000,000. Nowhere in the South has there been a more ambitious program conceived and executed.

The new plants, ranging in capacity from 3 to 42 m.g.d., vary in their process from sedimentation alone through chemical precipitation combined with trickling filters and magnetite strainers. All of the plants incorporate the latest advances in treatment practice and the use of newly developed mechanical equipment. Sludge digestion of the two-stage type, and utilization of sludge gas are employed; at two of the plants power production equipment is installed and plans have been made to so equip all the plants.

The disposal plants, however, are not the major item in the improvement program although they are the most spectacular. The extensions to the sewer system, ranging in size from 8 to 90 in. in diameter, the installation of which are now 75 per cent complete, cost about $5,000,000. The five disposal plants total another $2,000,000. To finance the undertaking, which has been under way since 1934, city and county funds combined with generous federal PWA and WPA allotments were made available.

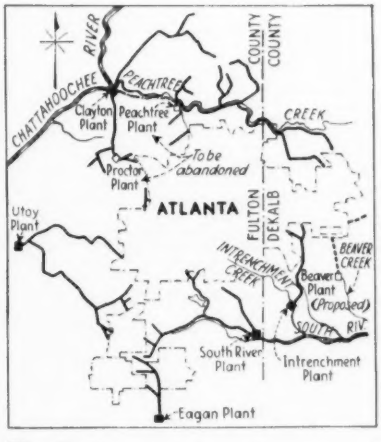


Fig. 1. Location plan of sewers and treatment plants.

Fig. 2. Creek crossing of the 90-in. interceptor to the Clayton plant.

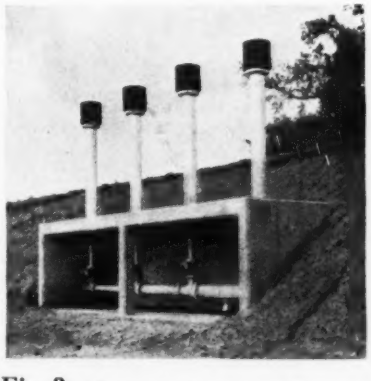


Fig. 3. Waste gas burners at Clayton.

The city covers an area of 34 sq. mi. and the plants are located on the outer fringes in beautiful suburban areas. These locations were made necessary by the fact that Atlanta is on a ridge dividing the streams that flow southwest to the Gulf of Mexico from those that flow east into the Atlantic Ocean. Quite naturally, therefore, the sewer system was laid out to drain outward from the center to the city limits. And because the city covers so large an area, it was more economical to build several plants than to construct interceptors served by only one or two plants.

The Clayton plant

All the plants are architecturally good to look at, but the Clayton plant has special attributes of attractiveness. The reasons for this extra attention were three-fold: first, it has been dedicated in honor of the late R. M. Clayton who served the city for 35 years as engineer, second, it is located in the midst of a choice suburban area, and finally, it is the largest of all the plants. From the massive, bronze doors and the granite facing of the administration building to the glistening steel domes of the digestion tanks, the plant represents aesthetic design combined with utility.

In brief, the treatment process designed to accommodate a flow of 42

m.g.d. includes: mechanically-cleaned bar screens and grit chambers followed by chemical mixing basins equipped to use diffused air; four circular clarifiers; two units of two-stage sludge digestion tanks each 90 ft. in diameter; and two vacuum filters for dewatering sludge. For power production two 180 hp. sludge gas engines are direct-connected with generators.

There are many interesting design features. One of these is the arrangement for handling screenings; following mechanical removal from the sewers the collected material is sluiced to a channel leading to two comminutors which shred the screenings. The shredded material is returned to the sewage flow. To eliminate unsightly operation and odors the screening and grit washing operations are housed in a separate building. For the same reason the underground grit and pre-aeration chambers are covered with concrete slabs and ventilated through an exhaust stack high above the plant.

The chemical handling facilities have been designed to practically eliminate all manual labor in this phase of the operation. Dry chemicals such as copperas, ferric sulphate and hydrated lime which are purchased in railroad car lots are removed pneumatically from a point at the track siding to overhead bins for storage. As needed, they are withdrawn pneumatically to screw conveyors which discharge to automatic feeding equipment serving the sludge conditioning tanks and the chemical mixing basins. Chlorine, purchased in 1-ton cylinders, is handled by means of a traveling crane arrangement operating between the railroad siding and the storage room.

Of special interest in connection with the chlorine storage is the safeguard to minimize danger should a leak develop. The storage room is provided with an exhaust fan system so installed that when it is in operation all air drawn from the room must first pass through a large chamber provided with high pressure water sprays. By means of this arrangement the gas will be absorbed

Fig. 4. Chemical feeding and mixing equipment.

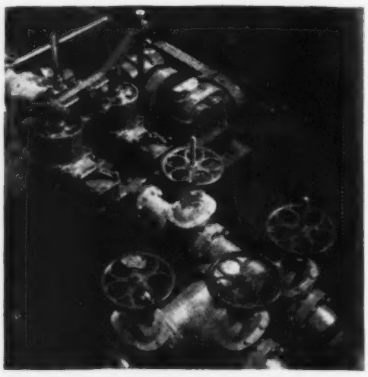
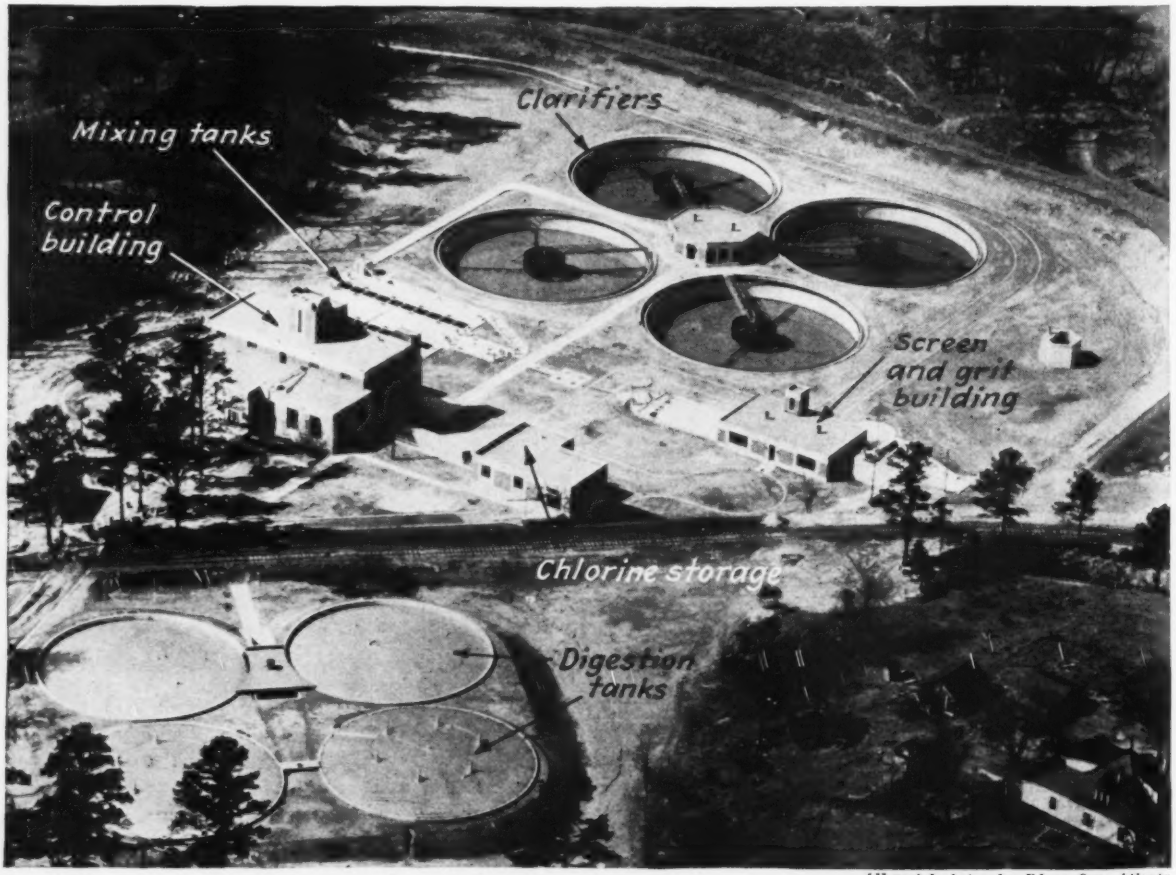


Fig. 5. A sludge pumping unit in the clarifier control house.



All aerial photos by Edgar Orr, Atlanta

Fig. 6. The R. M. Clayton works which provides primary treatment with optional chemical precipitation. A dike protects the plant from flooding during high river stages.

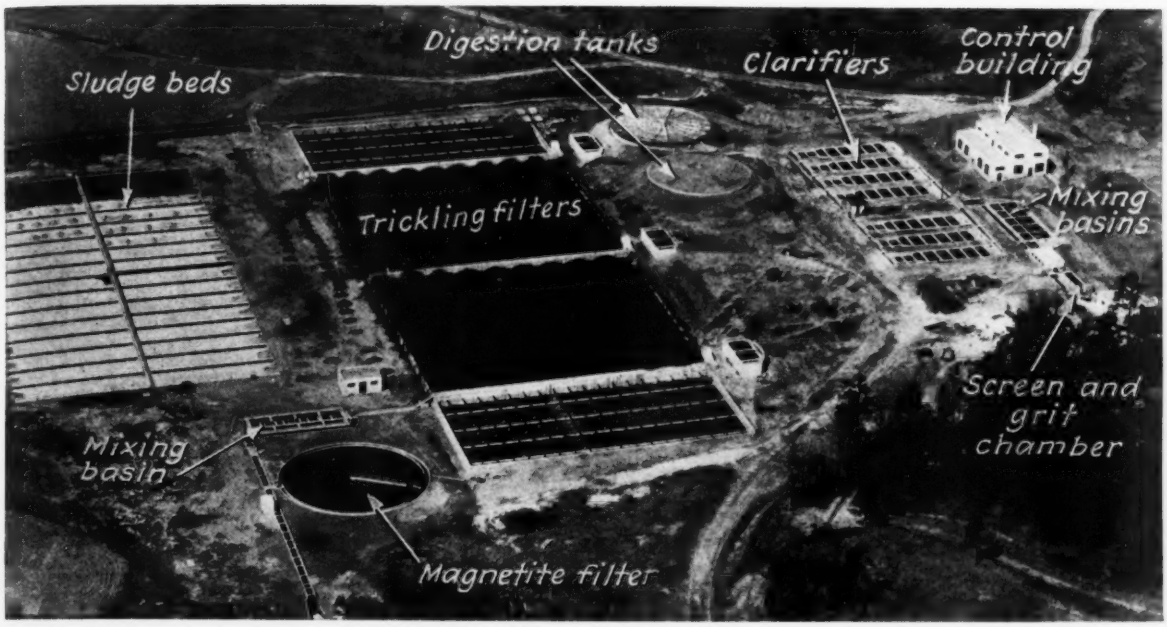


Fig. 7. Remodelled Intrenchment Creek plant where optional chemical treatment, trickling filters, and final clarification through a magnetite filter are employed.

Fig. 8. M. T. Singleton, consultant, and W. A. Hansell, assistant chief of construction and engineer of sewers.

Fig. 9. Intrenchment Creek. Control building and primary clarifiers.

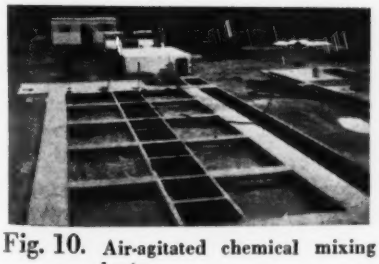


Fig. 10. Air-agitated chemical mixing basins.

before it is discharged into the atmosphere.

The Clayton plant, almost ready to go into operation, will supplant the old Peachtree and Proctor works.

Intrenchment Creek plant

The next largest plant, Intrenchment Creek (capacity 14 m.g.d.), is a trickling filter plant of the vintage of 1913. Heavily overloaded, the plant had long passed the stage of practical usefulness. However, it did offer possibilities of serving as the nucleus for the new treatment works.

Accordingly, the Imhoff tanks were converted into clarifiers with straight-line sludge removing equipment, and there was room to add one acre additional filter area to the existing two acres. Then, to reduce the organic load going to the filters, tanks have been installed where the sewage can be chemically treated and aerated prior to its passage to the clarifiers. Finally, to insure a superquality plant effluent chemical treatment facilities and a magnetite sand filter have been provided to "polish" the trickling filter effluent. To complete the modernization, mechanically cleaned screens and grit washers were added and separate sludge digestion tanks of the two-stage type were installed; the gas from the latter is utilized to develop power through two 120-hp. engines.

The sewage reaching this plant is subject to periods of high causticity caused by bleachery wastes. To adjust the pH for the correction of this condition the exhaust gas from the sludge engines and heaters containing CO_2 will be blown through the sewage. Provision has been made so that gas taken directly from the digester can also be blown through the sewage and then recovered for use.

Certain industrial wastes in the sewage, as yet undetermined, are believed to be partly responsible for achieving high sedimentation efficiency at this plant. Analyses indicate more than 70 per cent removal of suspended solids. When the chemical precipitation process is used this figure will probably be exceeded.

Experimental work

The decision to use chemical treatment at this plant, was based on investigations made on a 500,000-gal. experimental plant (see *Civil Engineering* Dec. 1935, p. 586). From these tests it was concluded that with the Atlanta sewage: (1) presedimentation does not effect a saving in chemicals when using chlorinated copperas: (2) adjustment of the pH to the acid side is more effective than the addition of lime, and that the use of CO_2 gas is a practical means of such adjustment; and (3) small doses of iron apparently condi-

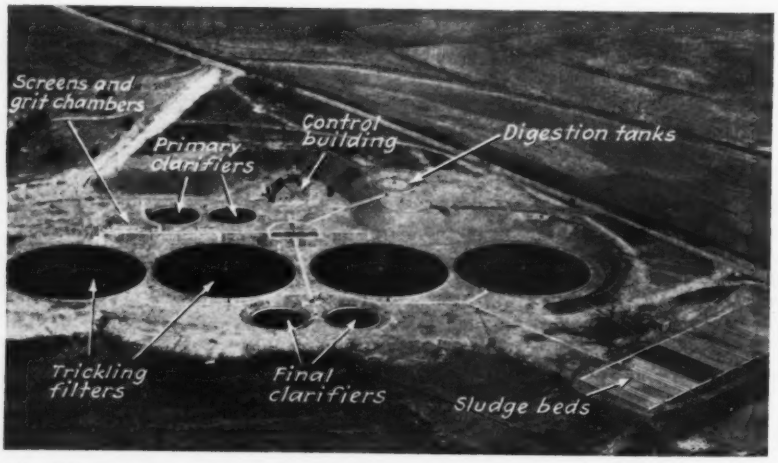


Fig. 11. Symmetrical pattern of the South River plant where four 173 ft. dia. trickling filters with rotary distributors are in operation.

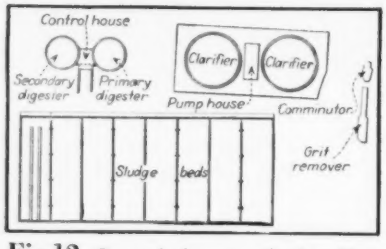


Fig. 12. General layout of the Utoy primary treatment and separate sludge digestion plant.

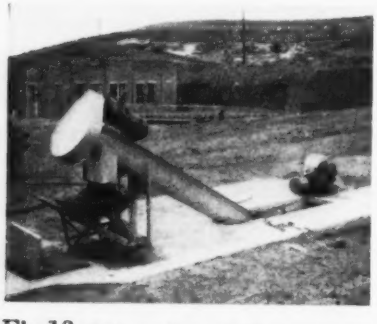


Fig. 13. Grit washer of the screw-conveyor type at Utoy.

tion the sewage by changing the character of the colloidal matter so that it is more amenable to trickling filter treatment.

South River and Utoy

The South River plant (capacity 6 m.g.d.) is a trickling filter installation with separate sludge digestion facilities and sand-drying beds. In addition to hand-raked screens, a comminutor and a mechanically-operated grit remover and washer, it includes two circular primary clarifiers, four circular filters of the revolving spray type, and two circular secondary clarifiers. For sludge digestion, which is carried on in two stages there is a primary tank with a floating cover, and a secondary storage tank with fixed cover.

The Utoy plant (3 m.g.d.) provides primary treatment only. The plant includes grit removers, comminutors, circular clarifiers, two-stage sludge digesters, and sludge drying beds. Both the Utoy and South River plants are now in operation.

Work will soon begin on the smallest of the Atlanta plants, the 0.75 m.g.d. Eagan treatment works. This will be a trickling filter and separate sludge digestion installation.

Detailed data on the four plants now completed are given in the appended schedule. The supervision of the work, including the design and construction of the sewer extensions, was under the direction of the city construction department. Clarke Donaldson is chief of construction and William A. Hansell is assistant chief and engineer in charge of sewers.

DESIGN AND ENGINEERING DATA

R. M. Clayton Plant

Treatment: Screening (with auxiliary comminutors) grit removal, optional chemical precipitation, sedimentation, chlorination, two-stage separate sludge digestion, gas recovery and utilization.
Capacity: 42 m.g.d. Population served 200,000 (designed for 300,000).
Grit Chambers: 2 units each 10x60x7 ft.
Chemical Mixing Tanks: 4 units each 15x80x12 ft. deep. 15 min. detention period. Aeration with diffused air.
Clarifiers: 4 112-ft. dia. tanks, 12 ft. deep, 2 hr. detention.
Digesters: 2 primary and 2 secondary tanks each 90 ft. in diameter, Capacity 1.65 cu.ft. per capita (300,000 pop.)
Sludge Filters: 2 8-ft. dia. vacuum filters each with 400 sq.ft. of filter surface.
Gas Engines: 2 180-hp. units.
Chemical Feeding: 3 dry feeders; 3 lime feeders; and 3 chlorinators.
Consultants: Wiedeman & Singleton.
Constructed by: Hardaway Contracting Co., Columbus, Ga., Smith-Pew Const. Co., Atlanta, Engstrom & Wynne, Inc. Wheeling, W. Va., and MacDougald Const. Co., Atlanta.
Cost: $830,000.

Intrenchment Creek Plant

Treatment: Screening and shredding, grit removal, optional aeration and gas treatment with or without chemical precipitation, sedimentation, trickling filters, optional aeration and chemical precipitation, magnetite sand filtration, two-stage separate sludge digestion, gas recovery and utilization.
Capacity: 14 m.g.d. Population served, 75,000 (designed for 117,000).
Grit Chambers: 2 units each 8x40x4½ ft.
Primary Chemical Mixing Tanks: 2 units each 15x80x12 ft. deep. 20 min. detention period. Aeration with diffused air.
Primary Clarifiers: 7 tanks each—20x96x 13 ft. deep. 2 hr. detention.
Trickling Filters: 3 acres, 6 ft. deep stone bed, spray nozzle distribution.
Secondary Chemical Mixing Tanks: 2 units 12.5x71x11 ft. deep.
Final Clarifier: 100 ft. dia., equipped with magnetite sand filter.
Digesters: 1 primary and 1 secondary tank each 90 ft. dia. capacity 2.3 cu.ft. per capita.
Sludge Drying Beds: 81,600 sq.ft. in area.
Consultants: Wiedeman & Singleton.
Constructed by: Works Progress Admin.
Cost: $500,000.

South River Plant

Treatment: Screens, comminutors, grit removal, sedimentation, tricking filters, secondary sedimentation, two-stage sludge digestion, sludge drying beds.
Capacity: 6 m.g.d. Population served 30,000 (designed for 50,000).
Grit Chambers: 2 units each 5x40x2.25 ft.
Clarifiers: 2 primary tanks 60 ft. in dia. and 11 ft. deep. 2 secondary tanks 60 ft. in dia. and 9 ft. deep.
Trickling Filters: 4 circular beds each 173 ft. in diameter and 6 ft. deep.
Digesters: 1 primary and 1 secondary tank, each 55-ft. dia. Capacity 2.1 cu.ft. per capita.
Sludge Drying Beds: 35,000 sq.ft. in area.
Consultants: Robert & Co.
Constructed by: Virginia Engineering Co., Newport News, Va.
Cost: $400,000.

Utoy Plant

Treatment: Comminutors, grit removal, sedimentation, two-stage separate sludge digestion and sludge drying beds.
Capacity: 3 b.g.d. Population served 10,000 (designed for 16,700).
Grit Chambers: 2 tanks, each 22 in. x 40 ft. x 24 in. deep.
Clarifiers: 2 circular tanks each 50 ft. in diameter and 9 ft. deep.
Digesters: 1 primary and 1 secondary tank, each 30 ft. in diameter. Capacity 2.0 cu.ft. per capita.
Sludge Drying Beds: 25,000 sq.ft. in area.
Consultants: J. B. McCrary Eng'g Corp.
Constructed by: Hardaway Contracting Co., Columbus, Ga.
Cost: $90,000.

New Clay Tile Floor System

ELWYN E. SEELYE
Consulting Engineer, New York, N. Y.

In a variation of the conventional one-way tile and concrete joist system the tile carries stress instead of acting merely as a filler

A NEW light-weight one-way clay tile and concrete joist construction has been installed in the several buildings recently completed for the new civic center at Princeton, N. J., known as the Nassau Development. Briefly, by using alternate high and low tile and permitting the thin concrete topping to fill the valleys, the tops of the high tiles become a part of the tee flange of the concrete joists as shown in the accompanying illustration.

Veterans among architects and builders will recall the days when the combination of rows of clay tile with reinforced concrete ribs between was standard for fireproof floor construction where flat ceilings were required. This construction although generally satisfactory tended to be superseded for reasons of economy by such systems as the metal tile and reinforced concrete rib, the steel joist and the two-way tile and joist. However, on account of its simplicity—it closely parallels wood joint construction—the one-way tile and joist construction held its own remarkably well, especially in localities convenient to tile manufacturers.

The engineers for the Nassau Development, not being satisfied with certain inefficiencies in this old one-way tile and joist system, attempted an improvement as follows:

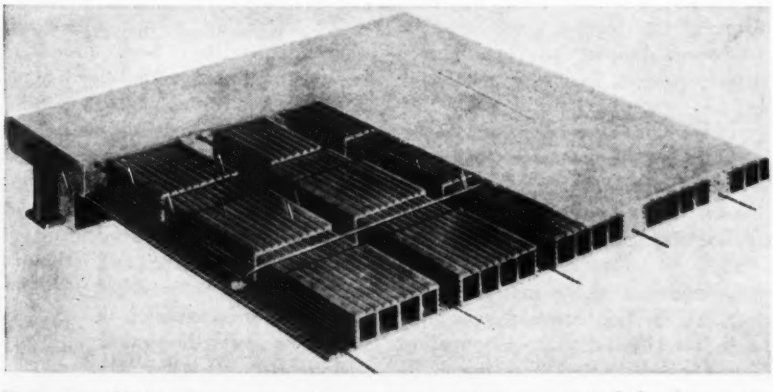
In the original system the strength was produced by a reinforced concrete tee-beam construction in which the tile acted only as a filler and as a surface to receive plaster. In this design the tile could have been omitted without affecting the strength adversely. This system was heavy, required an excessive amount of material and tended to load the supporting beams, columns and foundations unnecessarily. Obviously, one way to improve it was to increase the percentage of fillers by using a wider tile and thus reduce the amount of concrete. The first step therefore was to substitute a 16-in. wide tile for the 12-in standard width.

Making tile carry stress

The next step was to make the top of the tile work as part of or all of the tee flange but, as the tile laid end to end butted together dry, the compression stress could not pass from one tile to the next. This difficulty was overcome by making alternate tile shallower so that concrete placed on top of the low tile would provide the needed continuity.

In actual design it was found that for long spans the most economical combination consisted in using a 1-in. topping and figuring the depth of the tee flange at 1½ in. However, for short spans up to about 15 ft., the best economy results from omitting the concrete topping except over the low tile.

This system has been patented and the rights are owned by the John T. McCoy Co., New York City.



New tile-and-joist floor system with concrete topping as required for long spans. For shorter spans topping is confined to the valleys between the low and high tiles.

• • •

HIGHWAY SIDEWALKS for pedestrians along heavily travelled roads are being increasingly adapted. Two eastern states—Massachusetts and New York—recently provided for these safety measures, according to the American Public Works Association. Massachusetts appropriated nearly $8,000,000 last year for the construction of highway footways. New York this year provided for such construction by an amendment to the highway law. The new measure makes it possible to finance with state highway funds the building of sidewalks and installation of lights along state highways outside cities and villages. The superintendent of public works is empowered to let contracts for such improvements where he considers them necessary. State engineers estimate that sidewalk construction will cost on an average of $3,000 per mile.

• • •

Detroit Water Board Report

WATER BILL delinquencies in Detroit last year totaled $165,790 as compared with a peak of $1,157,600 in 1933. George H. Fenkell, consultant to the Water Board reported a total use of 93 billion gal. in 1937, a decrease over the previous year of 0.03 per cent. Consumers bills aggregated $6,093,000 of which the payroll absorbed $1,912,000. Several mains had to be laid to provide larger capacity to care for air conditioners. Some 2,200 tons of aluminum sulphate and 192 tons of chlorine were used at the purification plant.

Aerial Explorations Photo

SITE OF NEW YORK CITY'S RED HOOK PROJECT IN BROOKLYN

The New Public Housing Program

NATHAN STRAUS

Administrator, United States Housing Authority, Washington, D. C.

What it is, what the requirements are and how the program of low-rent, slum-clearance housing is progressing told by the administrator of the USHA

THE United States Housing Authority has signed loan contracts with municipal housing authorities totaling $53,493,000 for slum-clearance and low-rent housing programs in nine cities. The money has been drawn from the $500,000,000 authorized by Congress in the United States Housing Act of 1937. An additional $334,548,000 has been earmarked for 80 local housing authorities in 23 states and the Territory of Hawaii. These communities have indicated their desire to participate in the program in which the United States Housing Authority lends 90 per cent of the development cost of low-rent housing projects and annually makes contributions to the city to assure that rentals will remain within the reach of the slum families for whom the new homes are to be built.

The United States Housing Authority is moving at top speed in advancing funds to various localities as rapidly as possible. Present indications are that it will actually have put into circulation $400,000,000 by the end of June, 1939. We are now entering loan contracts at the rate of $60,000,000 a month, and we hope to step up our loan contracts even more within 30 days.

So keen is interest in the war on our slums that we have been virtually swamped with requests for earmarkings, and there is every reason to believe that the $500,000,000 now available for earmarkings will be exhausted by the first of July. Although an earmarking does not necessarily indicate approval of any specific project, it does mean that in each instance a comprehensive program for slum clearance and low-rent housing has been presented to the Administrator.

Local authorities organized

As evidence of the interest in the program, I might point out that when the USHA was set up last November, following its creation by the Wagner-Steagall Act, there were only 46 cities which had local housing authorities. At this writing there are 143—an increase of nearly 100 per cent—and the list continues to grow on an average of one a day.

In the same period, five states have enacted housing laws enabling their communities to share in the benefits of this program to blot out the slums. Today there are only 15 states which do not have the legislation necessary to enable their cities to participate in the USHA slum-clearance program.

To clear up a misapprehension that still persists in some quarters, it is well to emphasize that the Wagner-Steagall Act contemplates a non-federal program consisting entirely of projects locally initiated, locally constructed, locally owned and locally operated. The United States Housing Authority lends 90 per cent of the cost, extends advice and technical assistance, and assures that every step in the development of the projects conforms with the intent and provisions of the Housing Act.

Each of the cities for which funds have been earmarked has satisfied the

USHA that a financially-responsible and technically-equipped local housing authority has been set up to negotiate for the 90 per cent loan. And each city, moreover, has indicated that it will be in a position to put up the remaining 10 per cent construction cost of the projects.

USHA cooperation

Machinery has been set up to effect the closest possible cooperation between the local authorities and the U. S. Housing Authority in the formulation of a local project. In the early stages especially, the USHA is more than anxious to extend its assistance to the local authority in proceeding with a maximum of economy and a minimum of effort, at the same time protecting the local authority against spending money in the formulation of a project which the USHA will not later be able to approve.

Experience has taught us that care in the early stages of planning of projects will in the long run make for more speed, greater efficiency and truer economy. In the spirit of this credo, the USHA provides project advisers who consult with local housing authorities on their own bailiwick on the legal, economic, financial, planning and architectural phases of their proposed program. Through such consultation and advice a project can be whipped into better shape for a more speedy consideration and approval when a formal application is submitted to Washington.

In this connection it is well to emphasize that the USHA deals directly with local housing authorities. Any organizations or individuals who, for a fee, offer to promote projects or act as negotiators should be sent on their way. They are unnecessary, and certainly are not recognized or approved by the USHA.

Design requirements

The administration of this great program of slum-clearance and low-rent housing is not, however, without its serious, although not insurmountable, problems and difficulties. For instance, the act requires that in cities of less than 500,000 population, the cost of construction shall not exceed $4,000 per dwelling or $1,000 per room exclusive of what is paid for land, demolition and non-dwelling facilities. In cities of more than 500,000 population, the limitation on dwelling cost is $5,000, and the construction cost of rooms may not exceed $1,250.

However, the USHA has set up certain minimum requirements in the construction of all projects that necessarily tend to increase the cost. Thus living rooms may not be less than 150 sq.ft. and dining rooms not be less than 100 sq.ft. First bedrooms must have a minimum area of 120 sq.ft., second bedrooms 90 sq.ft., and third or fourth bedrooms 80 sq.ft. each. A kitchen is required for each dwelling and, whether a separate room or a part of one of the other rooms, the cooking compartment must be at least 60 sq.ft.; when the kitchen is to be part of dining or living rooms, this requirement is in addition to the minimum area required for these rooms.

With the nation entering upon a new program of low-rent public housing it is important that engineers and construction men have a clear picture of what is planned, what is being done and what the rules are. The current program is, in effect, the third phase of the effort to provide homes for low-income workers by benefit of federal subsidy. Private limited-dividend projects were tried and abandoned. Next, the PWA built a half hundred federal projects in about 35 cities to demonstrate the possibilities of low-rent housing to local communities. Now, the local communities, through municipal housing authorities, are being loaned money and given an annual operating subsidy to continue the work and, if possible, to make the costs meet the requirements of low-income families. If these three phases have represented a logical development they have also created much confusion by their diverse requirements. The following article by Mr. Straus should aid in dispelling this confusion so far as the current program and its rules and objectives are concerned.

—EDITOR.

Living rooms, dining rooms, kitchens and bedrooms are each counted as single whole rooms. Kitchenettes and dining spaces, when provided as extensions to living rooms or dining rooms, are counted as half rooms. A bathroom is included in every dwelling unit but is not counted as a room. Halls, closets, laundries, utility rooms, storage rooms and community or recreation rooms similarly are not included in the room count.

To make certain that the limitations on costs in the law are not exceeded, the USHA requires a 10 per cent margin in the estimates submitted by the local housing authorities. Thus, cities of less than 500,000 population must figure to limit costs, including contingencies, to $3,600 per dwelling unit and $900 per room, while the larger cities must submit their estimates on a basis of $4,500 and $1,125 respectively.

Another requirement having an effect on the cost is that in all cases the projects must be so constructed that they will last for 60 years—the term for which the loans are granted. While this provision tends to increase the initial cost, it greatly decreases the cost of upkeep over the life of the project, and reduces the annual charges for servicing the federal and local loans by amortizing them on a long-term basis. All these features mean not only long-term economy, but also low rentals throughout the life of the project.

Engineers, from their own experience, know the ultimate economy of good construction. It is unfortunate that the term "low-cost" has been so constantly applied to housing for low-income families, since the term suggests poor or cheap construction. It is false economy to permit jerry building or permit any departure from the most durable construction that can be designed. At the same time, our course is aimed toward the elimination of every item not indispensable to health and comfort.

In this work, the USHA's project planning advisers play an important part. Thoroughly familiar with every phase of large housing developments, and particularly with cost elements, their cooperation with the local housing authorities is a large factor in keeping the outlay on projects at the lowest possible level consistent with faultless construction.

Prevailing rates paid

Still another factor that enters into cost estimates is the provision of the Wagner-Steagall Act which specifies that wages or fees prevailing in the locality shall be paid all architects, technical engineers, draftsmen, technicians, laborers and mechanics employed on the project.

However, we feel certain that local

authorities, with the cooperation of the United States Housing Authority, will be able to keep well within the statutory cost limitations. This was indicated in the initial contracts signed by the USHA with 9 cities in which the dwelling facility costs per unit ranged from $2,549 in Austin, with a population of 60,000, up to $4,626 in New York City.

Slum Clearance

That the total development cost of projects under this vast program will be greatly affected by varying land costs also was made evident in the initial contracts. There is certain to be a wide discrepancy depending upon whether the buildings are located on vacant land or on central slum sites. No matter where the new building may be, I want to emphasize that all loans by the USHA are based on pledges by the local housing authority that slum dwellings equal in number will be demolished for every new family dwelling unit constructed.

I cannot too strongly emphasize the fact that where the new buildings are located on central slum sites, the added cost of clearing out these crime- and disease-breeding hovels cannot be allocated solely to the families to be rehoused, but must be counted as a general social benefit extended to the entire community. The surrounding property owners, the city budget, and the people of the whole city will benefit from the relatively higher expenditures involved in the clearing of central slum sites.

Another important phase of development costs includes demolition, grading, site improvements, the construction of utilities and the play spaces and other facilities provided for enabling the children to get fresh air and lead normal lives. The average added cost for such facilities is about $800 per family dwelling unit.

Contract construction

Of particular interest to the engineering profession are the provisions of the loan contract entered into between the United States Housing Authority and the local agency. Among these are:

The requirement that construction work be done by contract, after competitive bidding.

The submission to and approval by the United States Housing Authority of proposed and final construction contract documents.

The procurement of performance bonds and of compensation and liability insurance.

The prohibition of child and convict labor, discrimination in employment, interference with collective bargaining, and so-called "kick-back" payments.

The requirement of the payment of prevailing wage rates and other conditions of employment, including hours of work.

Compliance with provisions of the act relating to American-made materials.

Review during construction and submission of periodic reports.

USHA LOAN CONTRACTS EXECUTED WITH LOCAL AUTHORITIES

Augusta, Ga.	$1,369,000
Austin, Tex.	643,000
Charleston, S. C.	1,017,000
Jacksonville, Fla.	1,027,000
Louisville, Ky.	4,261,000
New Orleans, La.	8,411,000
New York, N. Y.	30,000,000
Syracuse, N. Y.	3,930,000
Youngstown, Ohio	2,835,000

While the objective of the United States Housing Authority is primarily slum-clearance and decent homes for those families now forced to live under slum conditions, the expenditure of $555,000,000 as provided for in the first three years of the program, will do much to relieve unemployment. Of this figure, $55,000,000, of course, represents the 10 per cent contribution by the local housing authorities to the development cost of their projects.

Two specific types of employment are created: the labor of actual construction and the labor in the fabrication of materials. United States Housing Authority engineers have roughly estimated that this program will provide 182,000,000 man-hours of labor at the site and, indirectly, 455,000,000 man-hours of labor in the manufacture of essential materials. Thus, on the basis of these estimates, direct and indirect labor will reach the substantial total of 637,000,000 man-hours. That is the equivalent of 402,000 men, each working 1,584 hours during a year.

Termite Infestation in San Francisco

A SURVEY of termite infestation in San Francisco buildings has brought from A. A. Brown, consulting engineer, the opinion that the menace of these insects in the United States is serious and widespread, but that construction planned to prevent their penetration could be carried out at an additional cost of not more than from one to two per cent.

The termite study, conducted by the City of San Francisco in cooperation with WPA, brought out some of the following figures covering the extent of infestation of buildings in that city: 36 per cent of 61 Class A buildings (fireproof frames of steel and all structural parts of incombustible materials) were infested; 37 per cent of 123 Class B buildings (frames of reinforced concrete with all structural parts of incombustible material) were similarly infested; as were 33 per cent of 761 Class C buildings (exterior walls of bricks, stone and concrete and interior frames of combustible material); and 81 per cent of 765 wood frame buildings.

Research workers found that direct contributors to infestation included defective plumbing, concrete form lumber left in place, leaky roofs, dampness and poor drainage, debris and nearby infested trees and stumps. Originally useful as forest scavengers, termites have followed their food supply into man-made structures, hence the present problem.

The report contends that much of the damage being done by termites can be prevented by proper building construction, and it asserts that architects and builders, because of their lack of knowledge of the subject, have actually created conditions favorable to their development.

Among other recommendations, Mr. Brown stated that a scientific study of the building ordinances in the light of this growing menace should be undertaken with a view to recommending methods which will minimize the present inherent danger and prevent damage to subsequent construction. He further commented, "in correcting the many defective construction details in buildings, little, if anything, will be added to the ultimate cost of structures."

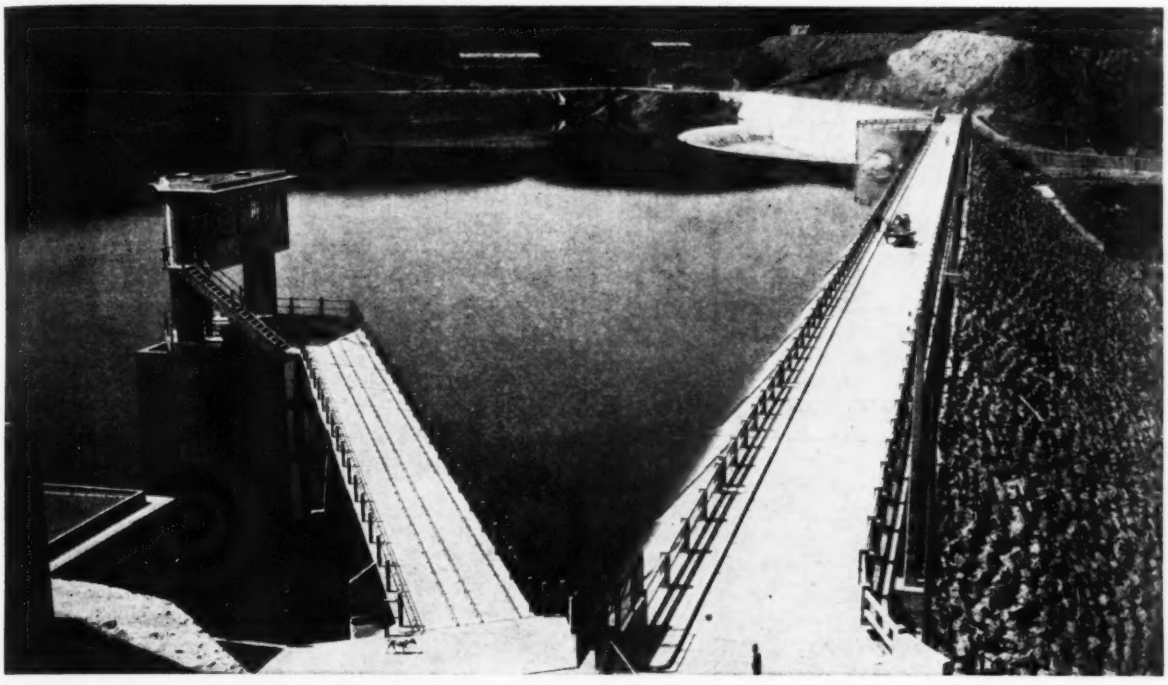


FIG I. BAKHADDA DAM WITH FULL RESERVOIR FOR ALGERIAN IRRIGATION WORKS

Algerian Rockfill Dam Substructures

I. GUTMANN

Editor, Engineering Index, New York, N. Y.

Placed rockfill dams in Algeria excel in underground construction to check underflow and provide drainage from within the structure itself

UNFAVORABLE ground conditions imposed a heavy task of subsurface construction in building four new dams for irrigation development in Algeria. As described in *Engineering News-Record* Dec. 2, 1937, the dams are costly structures of placed rockfill made watertight with concrete or asphalt deck slabs laid on the upstream slopes. These features of superstructure had counterparts in the cutoff walls, grout curtains and extensive drainage works for handling underdam flow and leakage into the rockfill. The details are interesting and in some respects unique.

The geological formation under all dams was exceedingly complex and unreliable as a water stop. Some of the accompanying sections indicate the conditions which were fully described in the preceding article.

In controlling dam underflow and seepage, water stops and drainage are naturally complementary elements of design but confusion is lessened if they are described separately. The water stops are of two sorts: Upstream-toe cutoff walls and upstream grout curtains.

Cutoff Walls — The cutoff walls vary somewhat in section but all follow the toe of the upstream slope and serve as abutments for the deck paving; all contain galleries for inspection and drainage.

At Bakhadda (Fig. 3) the wall following along the base of the deck well into the dam abutments, is generally not over 15 ft. thick, except at the deepest portion of the stream where its thickness is doubled by a thrust block joining its downstream face. The maximum depth of the wall is about 55 ft. below stream bed; the trench was grouted its entire length prior to pouring the concrete. The wall is surmounted by an inspection tunnel about 13 ft. in diameter; this carries off the drainage from the deck as well as leakage water, and it permits additional grouting and waterproofing, if required, even when the reservoir is full.

In view of the unreliable character of the foundation at the Ghrib dam, more generous dimensions are given to the cutoff wall since it may be subjected to stresses induced by the displacement of the underlying rock strata. Also the wall is made unusually high, nearly 40 ft. above the lowest portion of the stream bed, and 30 ft. above its junction with the deck. There are two interconnected tunnels within the wall, one about 10 ft. below its junction with the deck, which extends to both abut-

ments, and another, much lower, paralleling the lower profile of the cutoff wall and extending far into the abutments. The upper tunnel receives the drainage of the pavement supporting the deck; the lower, the drainage of the rock fill. The drainage water is removed by pumping.

At Bu-Hanifia, expecting that the underlying marl will subside and cause the overlying formation to produce bending stresses beyond the endurance of the cutoff wall, special precautions are taken to prevent the formation of cracks in the weaker portions of the wall; (1) sharp turns in the alignment of the wall are avoided; (2) vertical joints are inserted 50 ft. to 65 ft. apart, which will permit certain relative displacements without endangering the general imperviousness of the wall; (3) the lower part of the wall has been heavily reinforced.

The details of the vertical joints are shown in Fig. 2. The joint proper rests on a heavily reinforced concrete slab 13 ft. square, and at the top the inverts of the inspection tunnels surmounting the wall act as the heavy slabs at the bottom. The wall carries two parallel inspection tunnels along the middle zone of the dam, one of which extends as far as the abutments. In depth the wall reaches a sound layer of eocene marl, except at points where it may be utterly prohibitive to do so. As it is, its maximum depth is 230 ft. below the stripped ground.

Grout Curtains—To prevent underflow below and around the ends of the cutoff walls two parallel lines of holes a little upstream of the walls are injected with cement grout or with chemical hardeners. The location and arrangement differ for each dam but those at Bakhadda (Fig. 3) are representative.

The heaviest grouting operation was at Ghrib, principally on account of the sandstone strata which are visibly fissured both along the axis of the dam and perpendicularly to it; the main fissures vary in width from a hairline to 1 or 2 in. The contact surfaces between the sandstone and the marl are particularly dangerous, and the thin clay lenses within the sandstone encourage sliding.

The layer of marl, which is from 60 to 70 ft. thick, has been let alone, but the sandstone strata above it and below it have been carefully grouted through two lines of grout holes

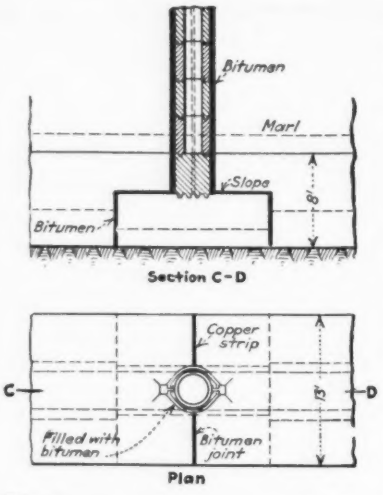


Fig. 2. Vertical joints permit movement in cutoff wall due to possible subsidence of Bu-Hanifia dam foundations.

about 5 ft. apart, forming two distinct grout curtains: (1) an upper one from the ground surface to the upper marl, which is at some points over 250 ft. deep, and (2) a lower one reaching the middle sandstone layer, about 70 ft. thick, that is to say, extending from the upper marl to the middle marl. At the abutment the maximum depth of this second grout curtain is nearly 400 ft.

The holes which are staggered and are spaced about 6½ ft. apart, are most of them grouted with cement, but some are grouted with sodium silicate and aluminum sulphate which react to form aluminum silicate. The drilling totaled over 400,000 ft. and grouting the holes and the tunnels consumed about 9200 tons of cement and about 133 tons of chemicals. The cost of grouting operations totaled 50,000,000 francs which is about $3,000,000 and about 17 per cent of the total cost of the project.

Unfortunately, the grout curtains do not abut on dependable formations and they may be outflanked by lateral percolation. Since it is impossible to foretell how far the curtains will have to be extended into the abutments so as to eliminate all danger from such lateral piping or percolation, the curtains have been extended for the present only so far as to preclude danger when the reservoir is half full. It has been assumed that a percolation path eight times longer than the depth of the water in the reservoir will provide ample security against piping. So far, with the reservoir half full the total leakage from the dam is less than 0.1 cu. ft. per sec. If it appears necessary as the storage level of the reservoir rises, the grout curtains may be extended further into the abutments.

The Bu-Hanifia operation again involved large volumes. At both abutments, where the formations are badly faulted and sound rock could not be reached by the cutoff walls, considerable grouting had to be resorted to. Two branching lines of grout holes had to be drilled at each abutment. Where the underground formations were very permeable and of a grading which prevented the penetration of cement grout, chemical grouting by a new improved process was resorted to. This new process, generally known as the K.L.M. process, was used successfully on several important foundation jobs in France and North Africa in preference to the chemical grouting methods developed in Germany and in U.S.S.R. (See *ENR*, April 9, 1936). The K.L.M. process offers these distinct advantages over the older methods: (1) the water glass and salt solutions, pre-mixed and pre-treated, *are injected simultaneously in one operation*; (2) *the time of set of the injected colloidal mixture can be regulated at will* to occur at the end of, say, one minute, 20 minutes or 2 hours after it has been prepared. It is claimed that with premature setting and clogging thus eliminated, K.L.M.

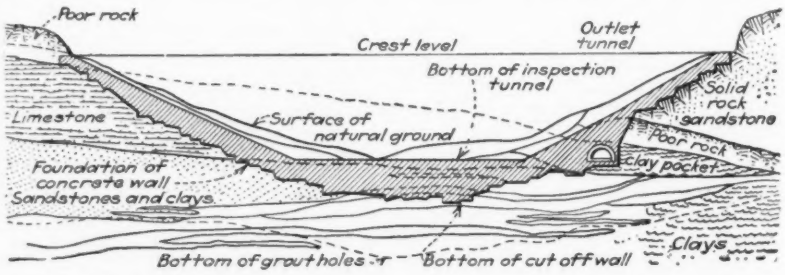


Fig. 3. Section showing cutoff wall and grout curtain at Bakhadda dam.

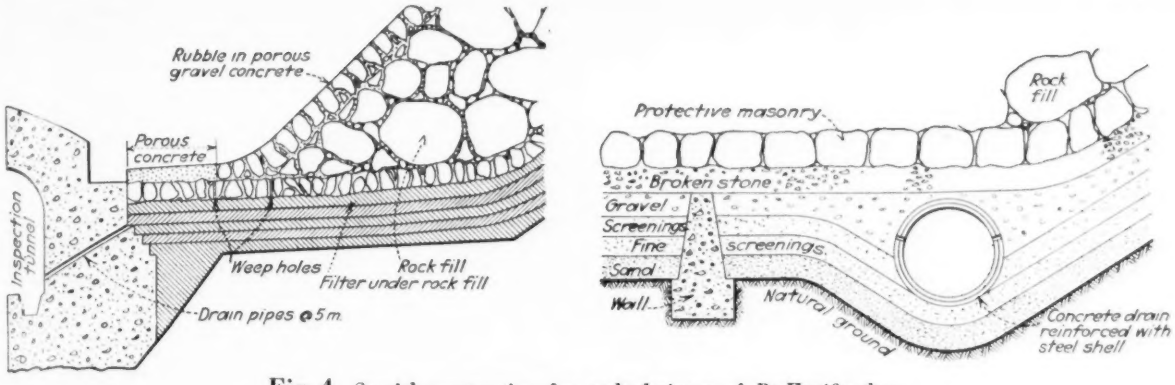


Fig. 4. Special construction for underdrainage of Bu-Hanifia dam.

grout will penetrate into very fine formations and will produce a more uniform job at lower cost.

The absorption of grout averaged about 33 lb. per sq. ft. of curtain for cement, and about 88 lb. per sq. ft. for silicate. The holes totaled 128,000 ft. and absorbed over 15,000 tons of cement and more than 5,500 tons of sodium silicate grout. Check wells will be drilled to test the effectiveness of the grout curtains by noting the rate of percolation for various water levels in the reservoir.

Drainage emphasized

Besides the defenses provided by impervious decks, cutoff walls and grout curtains elaborate provisions were made for drainage. At Bu-Hanifia these took the form of the most novel structures in modern dam building. It was felt that with a foundation so undependable, water might percolate through local points of weakness in the grout curtains, or in the cutoff wall, and cause dangerous regressive erosion under the dam. To prevent this it was decided to construct a protective filter bed, proposed by Dr. Karl Terzaghi of Vienna, to extend under the entire rockfill and to a line 33 ft. downstream. The protective filter bed, as constructed (Fig. 4) consists of five layers of porous materials averaging about 1 ft. in thickness. The topmost layer of crushed rock, about 1 to 2½ in. in size, is followed by a layer of ¼ in. to 1 in. crushed stone, next by two layers of screenings ranging respectively from ⅛ in. to ¼ in. and from about 1/50 in. to ¼ in. in size, and finally by a layer of dune sand of particles ranging from about 0.04 in. to 0.02 in. in size. The top of the filter is protected with a single course of unsquared masonry about 20 in. thick. Tests have shown that this type of filter will stand up on grades as steep as 74 per cent.

Below the topmost layer of crushed rock the filter bed is partitioned, both longitudinally and transversely, by concrete walls penetrating about 20 in. into the ground. The purpose of these partitions is to prevent excessive circulation of water in horizontal planes and to act as bulkheads, localizing zones of weakness where water may well up. Perforated concrete pipe drains, 45 in. in diameter, reinforced with steel cylinders, were laid within the second and third layers of the filter, counting from the top. Water appearing above the sand layers will be drained into these pipes and will discharge into a concrete-lined intercepting canal running along the toe of the dam.

At Bakhadda the deck is drained through gaps between the spurs of the base-slab panels at the vertical joints. (*ENR* Dec. 2, 1937). These gaps form continuous ducts discharging into the inspection tunnels through copper pipes piercing the top of the cutoff wall. There are also additional semi-circular drains arching over the sub-slab whose function is to relieve any pressure from water which may be trapped between the two slabs if the reservoir be suddenly drained.

At Fum-el-Gueiss the concrete deck is sub-drained by a system of porous clay pipes paralleling the slope of the dam and incorporated in the concrete lining of the upstream pavement. These pipes discharge into the general drainage system of the dam foundation. All schistous and marly areas exposed in the foundation were covered with protective concrete slabs on which the rock fill was subsequently placed.

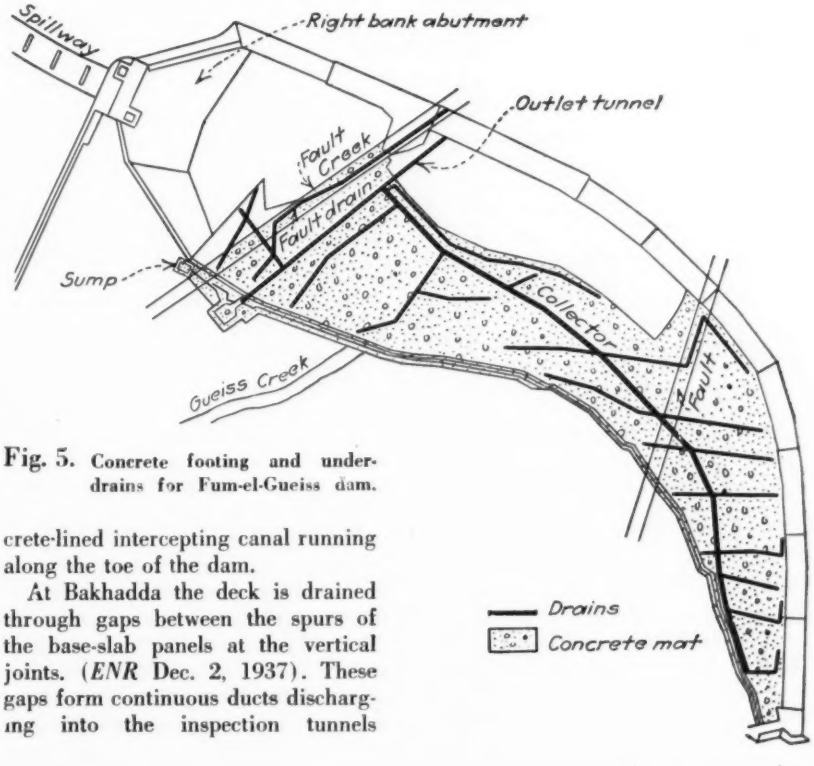


Fig. 5. Concrete footing and underdrains for Fum-el-Gueiss dam.

BOOK NOTES AND REVIEWS

The month's additions to the engineer's reading and reference list

Public Works Yearbook

PUBLIC WORKS ENGINEERS' YEARBOOK—1938—Including Proceedings of Public Works Congress, Oct. 4-6, 1937. 459 pp. Published by the American Public Works Association, 850 E. 58th St., Chicago. Price, $3.50.

The American Public Works Association's 1938 Yearbook makes available in compact form a comprehensive review of developments in the field of public works in the last year and also includes discussions on selected problems of current interest. The latter include the subjects given consideration at the 1937 convention of the association.

In the section devoted to a review of events and developments, some 20 authorities have written on matters pertaining to the administration, financing, and engineering of public works. Of special interest are the papers dealing with federal-state-city relationships, property tax limitations, and public works organization at Lincoln, Neb., and Boston, Mass. The second part of the book deals, among other things, with personnel problems, planning technique in small cities, refuse collection methods, rates for municipal utilities, and street construction practices. The business proceedings of the association and a roster of membership are also included in this volume.

A Bond Is Born

THE A B C OF MUNICIPAL BONDS—By Louis S. Lebenthal. 166 pp. Published by Harper Brothers, New York. Price $1.50.

Books on finance are not usually recommended for easy-chair reading but here is one volume on the subject of municipal bonds which can be read while relaxing—with profit. Mr. Lebenthal set himself to the task of explaining the essentials of municipal finance without being technical or dull, and he has done a good job. Writing for the layman as well as for public officials, he tells a story which, in his own words, describes how a "municipal bond is born, lives and dies." Having thus won the interest and attention of the reader he continues with a lively and enlightening discussion on the functions and principles of municipal financing practice. If you would like to acquire some basic information on finance in a painless fashion, this is your book.

Hydraulic Structures

HYDRAULIC STRUCTURES—By A. Schoklitsch. Vols. I and II: An English translation of Der Wasserbau. 1172 pp. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York. Price $18.

American engineers are indebted to the late John R. Freeman for having made possible the translation and publication in this country of this monumental work by Armin Schoklitsch. The translation was made by Samuel Shulits, one of the Freeman traveling fellows, and publication was financed in large part by the John R. Freeman Trust Estate.

In content the book is much broader than the title would indicate. This is especially true of the introductory chapters which make up about half of the first volume. These deal with meteorology, hydrology, hydraulics, flow in open and closed channels, and soil mechanics. The same is largely true of the remainder of the first volume which deals with water supply and sewage disposal and which gives a concise review of those subjects as related to European practice as a background for descriptions of the hydraulic structures involved.

Volume II relates to dams, outlet works, crest gates and intakes, hydroelectric power plants, penstocks, land reclamation, rivers and waterways.

The whole work relates to European practice, and is largely centered on central European practice. This may affect somewhat the value of the book to American engineers. Except for some minor references in the section on dams, there is nothing about American practice in the design of hydraulic structures. However, the limitation is natural and in no way detracts from the value of the information given concerning the many notable developments in hydraulic structures that are found in Europe, especially in the design of crest gate and other river control structures.

MISCELLANEOUS NOTES ON BOOKLETS AND REPRINTS

MORE DATA RELATING TO THE TVA are contained in a new pamphlet entitled "To Keep the Water in Rivers and the Soil on Land," published by the Tennessee Valley Authority, Knoxville, Tenn.

COAST PROTECTION on the North Sea coast of Holland, France, Belgium and Germany is the subject of a copiously illustrated paper which has been reprinted from the *Royal Engineers Journal* for March, 1937. Copies may be obtained for 60c. from the Institution of Royal Engineers, Chatham, England.

CITY TRAFFIC PROBLEMS are carefully analyzed in a well illustrated pamphlet entitled "Traffic Engineering and the Police" published jointly by the National Conservation Bureau and the Safety Division, International Association of Chiefs of Police. Copies may be obtained from the National Conservation Bureau, 60 John St., New York. Price, 40c., free to municipal and state officials.

CONSTRUCTION EXPENDITURES in 1937 are compared with those of 1936 in a pamphlet put out by the Works Progress Administration, Division of Research, Statistics and Records, Washington, D. C., which supplements an earlier publication entitled "Construction Expenditures and Employment, 1925-1936." The volume of construction is broken down into private, state and municipal, and federal construction. The total is placed at $7,002,000,000 as compared with the *Engineering News-Record* estimate of $5,852,000,000.

POLLUTION IN THE DEERFIELD RIVER is the subject of a WPA report sponsored by the Massachusetts Department of Public Health. The report indicates location of sources of domestic sewage pollution and the volumes and types of industrial wastes being discharged.

CLEVELAND'S MUNICIPALLY OWNED PUBLIC UTILITIES are the subject of an illustrated report designed to make citizens acquainted with the details of their public service enterprises. The report is being distributed by the Department of Public Utilities.

PERSONNEL ADMINISTRATION in the federal government—an analysis of existing practice with recommendations for the development of a career system—is discussed by Lewis Meriam in pamphlet No. 19, published by The Brookings Institution, Washington, D. C. Price, 50c.

NEW PUBLICATIONS

DESIGN OF DOMES and DESIGN OF ARCH ROOFS—By J. S. Terrington. Reprinted from "Concrete and Constructional Engineering". 31 pp. each. Published by Concrete Publications Ltd., London, Obtainable from The Engineers Book Shop, New York, Price, $1.50 each.

SUMMARY OF FINDINGS TO DATE—March 1938—Prepared by the National Research Project of the WPA. 155 pp. Published by the Works Progress Administration, Washington, D. C.

PROCEEDINGS OF THE MONTANA NATIONAL BITUMINOUS CONFERENCE—553 pp. Prepared and published by the Montana State Highway Department and Western Petroleum Refiners Association, Helena, Mont.

MANUAL FOR WATER WORKS OPERATORS—Prepared by Texas Water Works Short School. 278 pp. Published by Texas State Department of Health, Austin, Tex. Price, $2.

ENGINEERING MATERIALS AND PROCESSES—METALS AND PLASTICS—By William Howard Clapp and Donald Sherman Clark. 534 pp. Published by International Textbook Co., Scranton, Pa. Price, $4.50.

THE MUNICIPAL YEAR BOOK—1938—619 pp. Published by the International City Managers' Association, Chicago, Ill. Price, $5.

WELDING OF STEEL STRUCTURES—Report of the Welding Panel, Steel Structures Research Committee, Dept. of Scientific and Industrial Research, Great Britain. 326 pp. Obtainable from the British Library of Information, 270 Madison Ave., New York. Price $1.75 (paper cover).

A PRACTICAL TREATISE ON CHIMNEY DESIGN—By David A. Molitor. 123 pp. Published by the Peters Co., 243 W. Congress St., Detroit, Mich. Price $2.50 (paper cover).

BERECHNUNG DES EISENBETONS GEGEN VERDREHUNG (TORSION) UND ABSCHEREN—By Ernst Rausch. 92 pp. Published by Julius Springer, Berlin. Price 10.50 RM.

THE PREPARATION OF REPORTS—Revised Edition. By Ray Palmer Baker and Almonte C. Howell. 578 pp. Published by the Ronald Press Co., New York. Price $4.

FROM PLAN TO REALITY—II—By the Staff of the Regional Plan Association. 108 pp. Published by the Regional Plan Association, 400 Madison Ave., New York. Price, $2.

DAMS AND CONTROL WORKS—Second Edition. Description of Representative Storage and Diversion Dams and High-pressure Reservoir Outlet Works Constructed by the Bureau of Reclamation. 259 pp. Obtainable from the Superintendent of Documents, Washington, D. C. Price $1.

DRITTE ZWISCHENSTAATLICHE ZUSAMMENKUNFT DER LEITER DER SEEZEICHENVERWALTUNGEN—Tagungsbericht: July 5-15, 1937. 215 pp. Published by Wilhelm Ernst & Sohn, Berlin. Price, 12 RM.

STATISTIC OF UTILITIES (New Jersey), Private and Municipal, 1936—Published by the Board of Public Utility Commissioners, State of New Jersey. 167 pp.

STATE AND FEDERAL GRANTS-IN-AID—By Henry J. Bittermann. 550 pp. Published by Mentzer Bush Co., Chicago. Price, $4.

NEW ORLEANS CITY GUIDE—Written by the WPA Federal Writers' Project for the City of New Orleans. 430 pp. Published by Houghton Mifflin Co., Boston. Price $2.50.

Pamphlets

LABORATORY STUDIES OF CHEMICAL PRECIPITATION OF SEWAGE—Bulletin 40, Texas Engineering Experiment Station, College Station, Tex.

SOME THREE-DIMENSIONAL ASPECTS OF THE BRIDGE ROLLER PROBLEM—Bulletin 138, Iowa Engineering Experiment Station, Ames, Iowa.

SELECTION, INSTALLATION AND OPERATION OF SEISMOGRAPHS—Special Publication No. 206, U. S. Coast & Geodetic Survey; for sale by Superintendent of Documents, Washington, D. C. Price 10c.

SAFETY CODE FOR PASSENGER AND FREIGHT ELEVATORS—Canadian Engineering Standards Assoc., Ottawa, Canada. Price 50c.

THE USE OF NEW YORK STATE CLAYS IN MASONRY MORTARS—Bulletin No. 1, Ceramic Experiment Station, New York State College of Ceramics, Alfred Univ., Alfred, N. Y. Price 20c.

DEFINITIONS OF SURVEYING TERMS—Manual of Engineering Practice No. 15, American Society of Civil Engineers, New York. Price to non-members, 40c.

MOMENT EQUATIONS—A Method of Analysis for Continuous Beams and Rigid Frames—Bulletin No. 92, Engineering Experiment Station, University of Washington, Seattle.

GUIDES TO BUSINESS FACTS AND FIGURES—An Indexed and Descriptive List of Business Reference Sources. Special Libraries Association, 345 Hudson St., New York. Price $1.50.

HYDROELECTRIC POWER IN WASHINGTON—Bulletin No. 95, part V., A Bibliography of Technical Papers;—Bulletin No. 96, Part VI, International Boundary Waters.—Engineering Experiment Station, University of Washington, Seattle.

COLOR ANALYSIS OF PORTLAND CEMENT CONCRETE—Bulletin 139—Iowa Engineering Experiment Station, Ames, Iowa.

BIBLIOGRAPHY ON HIGHWAY SAFETY—Misc. Publication No. 296—U. S. Dept. of Agriculture. Obtainable from the Superintendent of Documents, Washington, D. C.

SOME ECONOMIC AND SOCIAL ASPECTS OF IRRIGATION IN MONTANA—Bulletin No. 354, Agricultural Experiment Station Montana State College, Bozeman, Mont.

TESTING PROCEDURE MOTOR VEHICLE DIRECTIONAL SIGNALS—Research Series No. 59, Engineering Experiment Station, Lafayette, Ind.

WATERWORKS OWNERSHIP IN THE UNITED STATES—Burns & McDonnell Engineering Co., Kansas City, Mo.

LOW INCOME HOUSING FOR SOUTHERN TEXAS CONDITIONS—The Texas Planning Board, Austin, Tex.

TARRALEAH POWER DEVELOPMENT—Published by the Hydro-Electric Commission of Hobart, Tasmania.

WATER RESOURCES IN NEW YORK STATE—Bulletin 30, The Black River; Bulletin 31, The Hudson River. Division of State Planning, Albany, N. Y.

TRAFFIC SURVEY, Los Angeles Metropolitan District, 1937—Engineering Dept. Automobile Club of Southern California, Los Angeles.

FIG. 1. THE END OF THE ROAD THAT BRINGS THE MOTORIST CLOSEST TO MT. BAKER'S 10,827-FT. HIGH PEAK

Code Unifies Road Work

L. V. MURROW

Director, State Department of Highways, Olympia, Wash.

A new highway code wipes out all previous road laws in Washington and starts the state on a new era of transport services free of needless restrictions

State highway laws have grown by accretion until now in many states the provisions are so numerous and scattered in so many statutes that only the highway department legal staff can hope to know them. For example in Washington, which is not an old state, there had been enacted by 1936, laws with 2,500 provisions relating to highways. In 1937 the state decided to eradicate the nuisance and substitute a highway code; it contains only 400 provisions and the following article tells how they work.
—EDITOR.

THE STATE OF WASHINGTON adopted in 1937 a State Highway Code that repeals and replaces all highway legislation since early statehood. Marked changes have followed in administration, financing and operation; construction of portions of the primary highway system to higher standards has been advanced and a definite program for constructing and maintaining a secondary state highway system has been initiated. Indeed with the new code and other legislation it is not exaggeration to say that the year 1937 inaugurated a new era of highway administration in Washington.

What the code is

Naturally the code is of first interest. It is too comprehensive a document to be described except in summary. The subject matter falls into four divisions, each of which was passed as a separate act by the 1937 Legislature: (1) The administration of state highways, including both primary highways and secondary highways, is contained in Chapter 53: (2) The administration of, and state aid to, county roads and city streets is contained in Chapter 187; (3) Motor vehicle ownership, registration and licensing, and the registration, licensing and regulation of motor vehicle operators is contained in Chapter 188; and, (4) Provisions relating to motor vehicle equipment and rules and regulations for the operation of motor vehicles on the public highways is contained in Chapter 189. Another act which may be properly considered a part of the code is the creation of the Washington Toll Bridge Authority in Chapter 173.

The highway code repeals previous statutes relating to highways, reducing the huge body of that law from some 2,500 provisions to around 400. This accomplishes the most beneficial purpose of simplified procedure and ready reference. Those provisions of the code which are an innovation and may be considered of primary importance are: (a) the prequalification of contractors on highway work; (b) the adoption of a uniform state standard of road markers and signs in accordance with the U. S. standards; (c) the adoption of a secondary state highway system as feeder or tributary to the primary system; (d) the adoption of a supervisory state-aid program with coun-

ties and cities; (e) the examination of motor vehicle operators; (f) the central reporting of motor vehicle accidents and the compiling and publishing of statistics; (g) the central reporting of stolen and abandoned vehicles and the dissemination of such information; (h) the weekly reporting of automotive repair concerns and, (i) the compulsory periodic inspection of motor vehicles.

As a supplementary part of the code the toll-bridge authority was created to centralize authority and to correct abuses that have grown up. For the past score of years the state has been confronted with the necessity of acquiring by purchase or condemnation at a price usually in excess of the cost of replacement of the structure, certain toll bridges that have been constructed throughout the state. The toll-bridge authority was created to eliminate these unsatisfactory experiences. It is composed of the governor, the state auditor, the state director of public service, the state director of finance business and budget, and the state director of highways. It has full power to issue revenue bonds, to make necessary surveys, to construct and operate such bridges as it may undertake to build and to fix rates for the use of the bridge if bonds are involved. All toll bridges constructed under the act will be publicly owned.

The toll bridge authority has already been requested to carry on studies and make the designs and estimates for two different bridges requiring the collection of tolls for the repayment of revenue bonds involved in financing the costs. One is located across The Narrows of Puget Sound between Tacoma and Big Harbor and a second across Lake Washington from Seattle to Mercer Island and on to the east shore of the lake. Studies indicate that a four-lane floating concrete-pontoon structure may be built on the Lake Washington site.

System changes follow

The new code brings three principal changes in system development. In considering these changes the specific figures and activities mentioned are for the year 1937, but while they apply strictly to a definite period they indicate conditions and trends that will continue.

More Primary Mileage—The 1937 legislature increased the mileage of the primary system by 275 mi., the major portion of which is made up of connecting links that in all probability should previously have been a part of the state primary system. The primary system outside of the incorporated cities now has a total length of 3,754 mi., which is supported by the following revenue:

(1) 1½ c. of 5-c. motor-vehicle fuel tax....	$4,354,000
(2) Motor vehicle registration fee	2,584,000
(3) Regular federal aid allotment	1,956,000
Total	$8,894,000

Although practically all of the mileage which is open to travel has been provided with a reasonably satisfactory surface, a large proportion of this mileage is obsolete and inadequate for present-day traffic conditions. The work on the primary highway system during 1937 has therefore been devoted largely to the reconstruction of these low-standard roads to present standards of design. After making necessary provision for the administration, maintenance and minor improvements, consisting chiefly of construction and reconstruction of low-cost bituminous surfaces, which work is ineligible for participation in federal aid, the remaining revenue was used to match the regular federal-aid allotment in carrying out major construction projects.

New Secondary System—By the creation of the secondary state highway system the department was given the responsibility for the construction, maintenance and operation of 2,254 mi. of highways which, prior to June 10, were under the jurisdiction of the various counties. This system of feeder roads tributary to the primary state system is supported from revenue derived from ¾c. of the 5-c. tax on motor vehicle fuel, which amounts to about $2,250,000 per year, plus the secondary federal-aid allotment, amounting to $400,000 per year, or a total of $2,650,000 per year.

New Revenue Allotment—The state revenue derived from the 5-c. tax on motor-vehicle fuel was divided be-

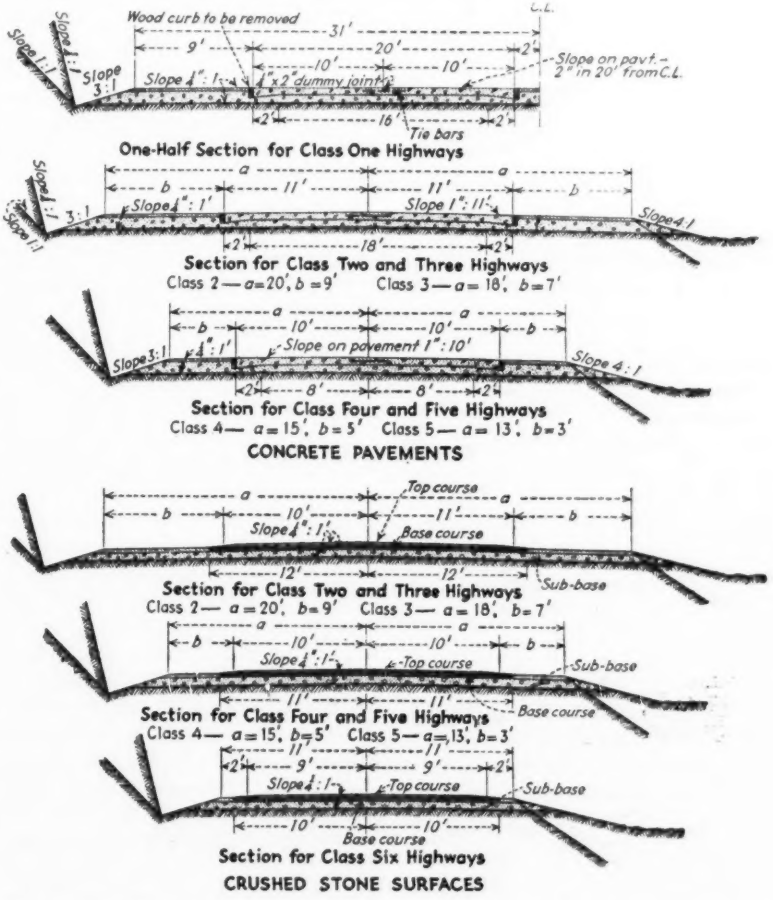



Fig. 2. Design standards for primary and secondary system highways in Washington.

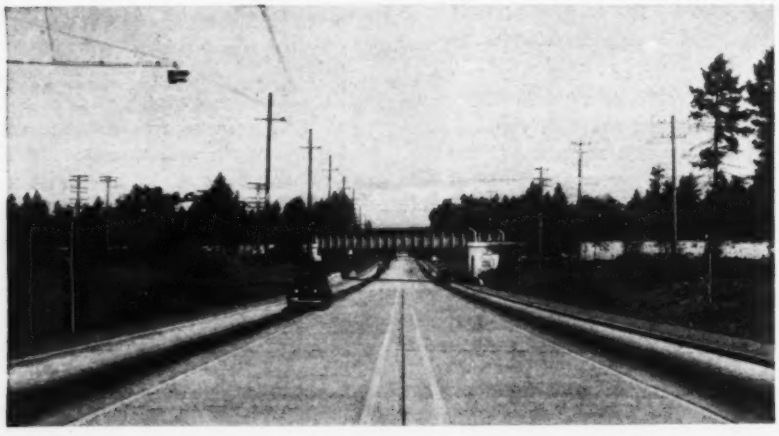


Fig. 3. South out of Tacoma is an example of Washington's class one roads; four-lane concrete with grade crossings eliminated.

tween the state, counties and cities as follows:

(1) for the primary highway system..1½ c.
(2) for the secondary highway system ..... ¾ c., and
(3) for county roads and city streets ..... 2¾ c.

An amount equivalent to $1.50 per capita of population was made available out of the 2¾-c. allotment in item (3) for the support of city streets of all incorporated cities, plus an allotment from the motor-vehicle fund of $500 per mile of city streets forming part of the primary system.

New engineering practices

The engineering practices of modern state highway departments are too many and varied to permit of a full survey in the length of an article that many will read. Naturally the Washington department is keeping abreast of current advances in road engineering. Some of the late developments are as follows:

Roadway Design—The most noteworthy progress in highway design during the year has been the improvement of location standards through the adoption of transition spirals or easement curves for all circular curves, and the classification of highways and the prescribing of design standards for them (Fig. 2). Primary highways are now designed for a speed of 80 m.p.h. with curves not to exceed 5½ deg. and secondary highways for a speed of not less than 40 m.p.h. with curves not greater than 15 deg. The design is based on Moyer's formula:

$$L = \frac{3.15V^3}{CR}$$

In this formula L = length of spiral; V = speed in miles per hour; and R = radius of curve in feet, and C = a constant, in this case 2, fixing the uniform rate of acceleration.

Where design standards cannot be obtained on a particular highway, curves are posted with proper caution and speed-limit signs. All curves of 1 deg. or more are superelevated. Grades are carried at the center line regardless of width, unless satisfactory drainage cannot be obtained by doing so. The maximum rate of superelevation is 0.13 per foot of width. The standard sight distance for 80-mi. highways is 1,230 ft. and for highways limited to speeds of 40 mi. is 400 ft.

Roadway Construction — Greater attention has been given to the proper construction of embankments and roadway sections. Embankments in general are constructed in compacted layers not to exceed 2 ft. thick; where paving is contemplated, the thickness of the layers may not exceed 8 in.

Subgrade soils are investigated, studied and classified and adequate foundation courses are provided to develop the necessary subgrade support. These courses extend across the entire width of the roadway from shoulder to shoulder to provide adequate drainage. On clay subgrades, a blanket of fine granular material is employed to prevent the infiltration of clay into the foundation course. Another practice which will insure better results in the construction of bituminous surfaces is the elimination of the use of soil fillers in the construction of crushed stone surfacing courses. Where a filler is required, crushed stone or sand filler only is used.

Bridge Practice—To improve the appearance of all highway structures from the standpoint of the traveling public, particular architectural attention is being given to bridge railings and to railroad undercrossings, in an effort to give them pleasing lines and to harmonize them with their settings. In several cases, ornamental pylons and approach plazas have been added where believed to be justified on important structures. In structural design, the aim has been to keep abreast of the most recent trends in the use of continuous and rigid-frame structures, wherever warranted.

Maintenance stressed

A major development in maintenance consists of a complete revamping of the highway-sign system which when completed will result in the use of reflectorized types of signs for all regulatory, warning and guide purposes. This type of sign on the highways has already demonstrated a reduction in the accident toll during hours of darkness. Another development consists of a 100 per cent application of center line striping of all pavement. This feature contributes largely to safety of operation of motor vehicles on the highways.

The department is continuing its demonstration of sodium vapor lighting on a 2.9-mi. section of the Pacific Highway. This demonstration section is in a fog-infested area and makes easily possible driving that otherwise would be both difficult and highly dangerous.

Snow removal in the mountain passes is another maintenance feature of considerable magnitude that must be reckoned with in Washington. Three mountain passes are maintained open to traffic throughout the winter season, these being Snoqualmie, Blewett and Satus. Other passes, three in number, are kept plowed out in the lower reaches, so as to facilitate an early as possible opening in the spring. On snow removal the department employs about 250 rotary and blade plows of different types.

Radio contributes largely to the successful handling of all maintenance undertakings and particularly those involving snow removal and the clearing of slides. The system that has been developed consists of 19 fixed stations located at various operating headquarters, and 16 stations attached to mobile equipment.

such as rotary snow plows. In addition, the official cars of all employees assigned to maintenance work are equipped with receiving sets, which enable them to be reached at all times and so kept in close touch with all matters that pertain to their work.

Control of operation

Aside from the provisions of the new highway code, in recent years there have been developed new phases of highway work which have become fixed policies. The proper operation, control and handling of traffic is becoming of increasing importance. Among these new phases of highway work which are of major importance may be included: (1) roadside development and beautification; (2) highway lighting; (3) directional and caution signs; (4) the careful planning of intersections and separations to avoid interference of the lines of travel; (5) the control of truck loading by weighing stations; (6) safety.

Safety Measures—In the interests of safety, the new highway code has provided the department with the authority to adopt a state standard of road markers and signs and the law provides that this state standard shall be adhered to by the state, counties and cities. The central reporting of accidents with analyses made available to the department will now give the opportunity to study accident frequency localities, to determine accident causes and to correct any physical conditions which may be found to contribute to accidents. Considerable construction in recent years has accomplished a reduction in gradients and curvature and the removal of obstructions to view to serve the increased speed and volume of traffic. Beyond purely engineering matters, the department has entered into safety education, lending its facilities and personnel to safety campaigns, and also giving secretarial assistance to the Washington State Safety Council.

Weighing Stations—The department continued throughout 1937 to operate and extend its system of weighing stations for the regulation of truck loadings. This has largely contributed to preventing destruction of roadway surfaces by overloading. At this time such regulation is being extended to include testing of vehicles to insure that they are not defective and are safe to operate on the public highways.

Fig. 4. Up in the mountains (Blewett Pass) a two-lane bituminous type road is an example of primary road service.

The operating bases for this weighing system are 28 scale houses located at strategic points in the state. The average operating time during the year 1936 was 1,582 hours per station, at an average cost of $1.24 per hour. During that period 369,818 vehicles passed over the scales, with a total of 5,884,161,695 lb. gross. Of this number, 1 in every 16 was over the license capacity of the vehicle, necessitating an increase in license. The recorded amount received from licenses issued through the scale houses totaled $158,675, or an average of $3.58 per hour of operation. Subtracting the operating cost of $1.24 leaves $2.34 per hour net income through scale-house operation in addition to the original saving in maintenance costs.

Saving in maintenance is difficult to estimate because of changing conditions from year to year; however, the following item will indicate what may be accomplished. On a stretch of 20 mi. of bituminous road, after the frost had come out of the ground, the spring maintenance averaged $7,500 per year. Patrolling the road and limiting the loads and speed for a period of six weeks during this frost period reduced this cost to $2,500, or a saving of $5,000. The expense in connection with the protection ran less than $500. Facts do indicate that the reduction in maintenance cost exceeds many times the revenue from additional licenses.

Today there is no legitimate operator in this state, who is familiar with the scale-house operation, that will not endorse the system. Over a period of time it has been proven that the cost of tire replacement is materially reduced by proper loading; the motor overhaul, the replacement of differentials and transmissions, which were a major expense, have been cut substantially; gas and oil consumption has been lessened, and, still more important, the equipment has operated with fewer interruptions. The trucker today feels that the scales are a necessary part of his business and some of the larger trans-state operators in Seattle and Spokane have installed their own weighing equipment and carefully check each load before it leaves the plant.

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Tunnel Entrance Lighting

THE LIGHTING of the Tooth Rock Tunnel, on the Columbia River Highway in Oregon, as described in the *General Electric Review* for January, 1938, is unique in that attention has been paid to the momentary but hazardous loss of visibility as a motorist enters the tunnel from bright daylight conditions. This contrast is eliminated by providing a relatively high level of illumination with incandescent lamps along a 150-ft. section of the tunnel at each portal. A photoelectric relay switches this supplementary entrance lighting on at dawn and off at dusk. Sodium luminaries, with 10,000-lumen lamps, provide a continuous illumination of about 4 foot-candles in the remainder of the tunnel.

Memorial Tower Construction

Construction features of Edison Tower and San Jacinto Memorial described by the builders

In the issue of March 10, page 374, an account of the American Concrete Institute meeting in Chicago in February was published, omitting reports of two papers on memorial tower construction. Two outstanding towers built during 1937, one in New Jersey and one in Texas, are described below. — EDITOR

Two noteworthy memorial towers were completed during the last year, the Edison Tower at Menlo Park, N. J., and the San Jacinto Memorial near Houston, Tex. Prominent features of the construction procedure of the two towers were described at the annual meeting of the A.C.I. by J. J. Earley, architectural sculptor, Washington, who made the architectural concrete slabs that form the outside facing of the Edison Tower, and C. A. Bullen of the W. S. Bellows Construction Co., Huston, who built the San Jacinto Memorial.

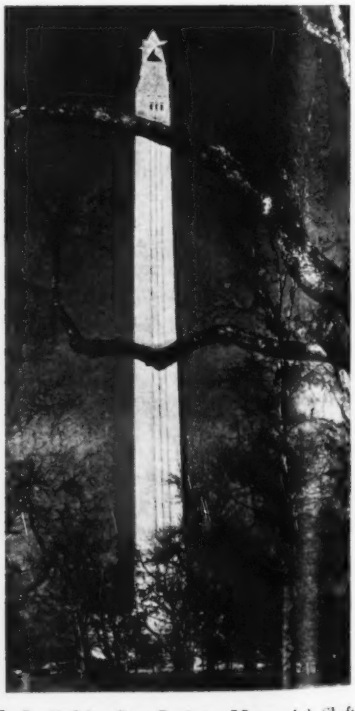
The Edison Tower is 130 ft. high, octagonal with a buttress on each corner, and tapering upward. The color of the exterior is changed progressively in 10-ft. lifts from black at the bottom to bright at the top,—black, yellow blending into white, tempered with cobalt blue. The entire exterior is formed of precast slabs 2 in. thick and 10 ft. high by the full width of one side of the octagon or the full girth of a buttress, the slabs being set up in 10-ft. lifts to serve as outside form for the concrete for the body of the tower walls. Slab reinforcement is 4 x 4-in. welded mesh, 4 gage with No. 0 rods for stiffness and attachment.

The slab material is concrete mixed 1:1:3 by volume of cement and fine and coarse crushed aggregate, with 5 gal. of water per sack of cement. The molds were removed when the concrete had set and the outer surface of the slab was at once brushed with steel wire brushes and later cleaned with weak muriatic acid. The aggregates are, for the black slabs: black glass, two values of black ceramics, and a vivid red glass; for the yellow: yellow quartz, rose quartz and two values of yellow ceramics, the rose quartz being varied to give the tone shading; in the higher levels of the tower, omission of the yellow ceramics and addition of quartz pebbles shades the aggregate to all white quartz, while in the upper sections cobalt blue ceramics are added.

Twenty miles southeast of Houston, on the San Jacinto battle field (1836) Texas last year erected a memorial consisting of a stone-faced octagonal shaft 570 ft. high. The shaft is 48 ft. wide at the base, tapering to 19 ft. at the top, and carries a stone-faced star of structural steel and concrete 34 ft. high. The walls of the tower are 4 ft. thick at the base and 2 ft. thick at the top, and were poured against the facing stone as outside form in lifts one course (2 ft.) high.

The tower rests on a concrete slab 124 ft. square, 5 ft. thick at edges and 15 ft. thick at the center, containing 5,700 cu.yd. which was poured in one continuous operation of 57 hours. Relief labor had to be used, as the job was in part financed by PWA. Continuous concreting having been specified, elaborate precautions to guard against interruptions were taken in the use of duplicate and triplicate equipment, training of the workmen, provision of sandwiches and coffee for the concrete gangs, and provision of a tent to cover the work. The food consumption was one cup of coffee and 2/3 sandwich per cu. yd.

Tower erection was handled with aid of an inside steel tower equipped with hoists and kept 100 ft. above the tower work to support a working platform and two inside and outside scaffolds, the outer ones being for stone setting (upper) and for cleaning and pointing (lower), the inner ones for form building and pouring (upper) and form wrecking (lower). The 8,000 lb. stones in the lower part of the tower were set by two Chicago booms on opposite corners of the tower. The 500-lb. blocks of the main part of the facing were hoisted on the cage in the tower and lowered to place through trap doors in the working scaffold by hand stone derricks.



Edison Memorial Tower at Menlo Park, N. J. (left). San Jacinto Memorial Shaft (right) rises 570 ft., 15 ft. higher than Washington Monument.

THE WEEK'S EVENTS

(*Continued from page 735*)

OBITUARY

ROBERT A. GREENFIELD, architect and engineer who had practiced in the northeastern states, particularly upstate New York, died in Geneva, N. Y., May 17 at the age of 71. Greenfield practiced in Buffalo at the turn of the century and later worked for the U. S. Treasury Department on construction of federal buildings. He retired about a year ago.

JAMES H. COYNE, Port Townsend, Wash., road and bridge contractor, died there May 10 at the age of 67.

CLYDE L. MORRIS, 61 president of the C. L. Morris Construction Co. of Seattle and secretary-treasurer of the Arctic Construction Co. died in Seattle May 11.

CHARLES F. MICHAEL, founder and president of the Ohio Locomotive Crane Co. of Bucyrus, died there May 4.

LARS R. JORGENSEN, 62, patentee of the constant angle arch dam died in Berkeley, Calif, May 8. Jorgensen, a Dane, was educated in Germany and came to this country in 1901, to work for General Electric. Two years later he went to the Pacific Coast and worked for several power companies until 1907, when he became a member of the consulting firm of F. G. Baum & Co. It was during his service with that company that he developed the constant angle dam, and seven years later he formed his own company, the Constant Angle Arch Dam Co. of San Francisco. From that time until his death he practiced actively in connection with his patented dam. Jorgensen was at one time chief engineer of the Feather River Power Co. and in 1918 was awarded the Norman gold medal of the Am. Soc. C. E. for his paper, "Multiple Arch Dams on Rush Creek, Calif."

CHARLES F. LYTLE, Sioux City, Iowa contractor who had done work in many parts of the United States died of a heart attack at Council Bluffs, May 9 at the age of 68. Lytle was especially active as a paving contractor; he had built more than a thousand miles of highway in the midwest as well as the first concrete road ever built in Florida. Among his outstanding projects are the Manatee River Bridge in Florida, the Harvey Lock at New Orleans, a large viaduct in Sioux City, and a 14-ft. concrete siphon for the North Platte Power District in Nebraska. Lytle has just been awarded a contract, jointly with Johnson Constructures Co. of Minneapolis, for the Possum Kingdom Dam on the Brazos River in Texas.

WALTER L. CLARKSON, for 30 years a consultant in Bayonne, N. J. and for most of the last 25 years city engineer there, died in Bayonne May 11 at the age of 66. Clarkson started his engineering work in 1890 as an axeman for the Bayonne firm of Smith & Weston, rising to take full charge of office and field work for the firm. He entered private practice in 1905.

HOMER H. WYSS, 61, former chief engineer of construction of the Ohio highway department, died in Delaware, Ohio, May 7.

BRIEF NEWS

THE TOWN of Vidalia, La., population about 1,000, is being moved a half mile to a new 1,000-acre site. The town, across the river from Natchez, is being moved because the U. S. Engineers find it necessary to widen the river at that point. Cutoffs to eliminate bends upstream have resulted in a piling up of water at Vidalia. Of the cost of the moving, $437,000 is being borne by the federal government and $50,000 by the local levee board.

THE FINAL legal step preceding the start of construction on the Red Hook and Queensbridge housing projects in New York City was accomplished May 14 when a contract between the city and the New York City Housing Authority providing for annual payment of $65,000 in lieu of taxes was signed. Demolition of existing buildings on the two sites is getting under way.

PROGRESS in preventing pollution of streams by Florida citrus canneries is reported by the Winter Haven Citrus Laboratory of the Department of Agriculture. Experiments with a trickling filter at Winter Haven have shown promising results. A growing volume of complaints has charged that residue from the citrus plants resulted in the killing of fish by exhaustion of oxygen.

THE CITY TRAFFIC COMMISSION of Columbus, Ohio, has recommended installation of 1,000 to 1,400 parking meters. It is suggested that the meters be rented, with an option to purchase after nine months.

SIX ARTIFICIAL ISLANDS are under construction in Lake St. Marys, inland Ohio lake, and will probably be completed in the fall. They are intended to afford a refuge during storms for people boating or fishing. The 15,500-acre lake has no natural islands. The largest of those being built will be about 3 acres in extent. The islands are also expected to protect the shore line from wind erosion.

THE KELVIN gold medal of the Institute of Civil Engineers, London, has been awarded for 1938 to Sir Joseph Thomson, Master of Trinity College, Cambridge, in recognition of services to engineering science. The institute's James Alfred Ewing Medal, founded in 1936, has been awarded to Charles M. Franklin for research on directional radio.

RESOLUTIONS by the Wisconsin construction industry conference urging modification of WPA procedure have received endorsement from the Ohio Construction Council. The council is circulating petitions to be presented to Congress.

THE WISCONSIN RESOLUTIONS were also endorsed, May 10, by the newly organized Michigan Construction Federation.

A NEW BUILDING CODE is being prepared for the city of Endicott, N. Y. It will be based on the model code of the New York Mayor's Conference.

LAST of the above-ground work on the Colorado River aqueduct was completed May 8 when the J. F. Shea Co. poured the last concrete in open conduit. Open work on the aqueduct includes 63 miles of concrete lined canals, 55 miles of 16-ft. concrete conduit, and 29 miles of reinforced concrete siphons. Only the San Jacinto and 700 ft. of siphons at its west portal remain to be completed on the main line of the aqueduct. All but two miles of the 13 miles of tunnel have been excavated.

GASOLINE TAXES in the various states yielded a total net revenue of $751,998,000 in 1937, as compared with $691,420,000 in 1936, according to the Bureau of Public Roads. Consumption of gasoline on the highways,

amounting to more than 19 billion gallons, increased 7.6 per cent over 1936. Increases are reported in every state except Nebraska and Tennessee.

HOUSING FUNDS of $23,550,000 were earmarked for four cities May 9 by the U. S. Housing Authority. The new earmarkings include $12,000,000 for Newark, N. J. and an additional $8,000,000 for Baltimore. Earmarkings were thus brought to $334,548,000.

TWO MORE housing projects were leased to local authorities by U.S.H.A. May 9 and 10. At the same time that Schonowee Village in Schenectady and Baker Homes in Lackawanna, N. Y. were leased, shelter rent schedules averaging $4.84 and $4.02 per room per month, respectively, were approved.

THE ALBERTA ministry of public works has decided to do all road building in the province by day labor, rather than let contracts. It is felt that savings can be made by reducing the amount of road building equipment which has to be maintained.

PERSONAL

M. B. STARR, for ten years county engineer of Plymouth county, Iowa, has resigned effective June 1.

A. R. TAUBMANN, for nine years county engineer of Hubbard county, Minn., has been made county engineer of Rice county.

IRA J. TAYLOR has resigned as Idaho commissioner of public works. Taylor was recently absolved of any "corrupt" motive for failing to account to the state treasury for funds he handled while prison warden, but was fined $1,000. The verdict did not disqualify him from holding office.

ALAN C. MERRITT, civil engineer and contractor, has been appointed commissioner of public works of Idaho, succeeding I. J. Taylor. Merritt helped organize the state highway department in 1917 and is a member of the state planning commission.

EUGENE BOLLAY, meteorologist for the Los Angeles county flood control district, has left that position to join the flood division of the U. S. Weather Bureau in Washington, D. C.

IRVING P. KRICK, professor of meteorology at California Institute of Technology, has been retained by the Los Angeles county flood control district to prepare daily forecasts for its hydrology department. Krick will also make a special study of reasons for localized high intensities of rainfall in the Los Angeles area.

E. B. MARTIN, for several years on the staff of the Montana state highway department, has been employed by the South American Gulf Oil Co. to have charge of construction of a highway at Barrequill, Colombia. Martin graduated in civil engineering from South Dakota State College in 1926.

E. A. DOUGHERTY, assistant chief engineer of the New York Central R.R., has been made assistant to the vice-president of the system, with headquarters in Chicago.

J. M. DOORLY, engineer of the New York terminal district of the New York Central, has been appointed assistant chief engineer, succeeding E. A. Dougherty.

A. D. WOLFF, JR., assistant engineer of the New York terminal district of the New York Central, has been appointed designing engineer with headquarters at New York.

L. C. TSCHUDY, for the past three years regional engineer for Region 9 of the Soil Conservation Service of the U. S. Department of Agriculture at Rapid City, S. D., has been transferred to Region 7 with headquarters at Salina, Kan. There he will have charge of engineering activities of the service in the states of Kansas, Nebraska, and Oklahoma.

EDMOND LATOURELLE has been appointed construction inspector for the Quebec department of education and health.

ALEXANDER V. KARPOV has resigned his position with the engineering division of Aluminum Co. of America to practice consulting engineering. A native of Russia, Karpov came to this country in 1920. He has worked on the design of hydro-electric projects and bridges for the Standard Arch Co. of New York, the West Penn Power Co., the Pittsburgh department of public works, and the Aluminum company. He has also been connected with the Charles T. Main Co. of Boston. Karpov is a holder of the Thomas Fitch Rowland prize of the Am. Soc. C. E., which he received jointly with R. L. Templin two years ago.

CHARLES D. CROSNO will become head of the department of engineering at Arkansas State College in September, succeeding M. H. Brown.

NATHANIEL A. CARLE, city engineer since 1936 at Seattle, has resigned that position at the request of the new mayor.

R. M. TAYLOR, district engineer at Kamloops for the British Columbia department of public works, has been put in charge of the first engineering district with headquarters in Vancouver.

W. L. LANGLOIS, formerly connected with the Ontario Department of Northern Development, has been appointed engineer of Hastings County, Ont. Langlois is a graduate of the University of Toronto.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Chalfonte-Haddon Hall, Atlantic City, June 27-July 1.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, annual meeting, Texas A. & M. College, College Station, Texas, June 27-30.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, summer convention, Washington, D. C., June 20-24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual convention, Hotel Utah, Salt Lake City, July 20-22.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Portland, Aug. 9-12.

REGIONAL AND LOCAL

PENNSYLVANIA SEWAGE WORKS ASSOCIATION, annual conference, State College, Pa., June 8-10.

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Short Course

A TRAINING SCHOOL for highway superintendents will be held at Cornell University, Ithaca, N. Y., June 22-25. It is sponsored jointly by the Town and County Officers Training School of New York State, the State Association of Superintendents of Town Highways, the State College of Agriculture, and the College of Engineering.

COURSE for public health workers and sanitarians employed by Texas municipalities, at Texas Technological College, Lubbock. Sponsored by state Department of Health and League of Texas Municipalities.

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License Examinations

MICHIGAN: Examination for architects at the Universities of Michigan and Detroit and for engineers and land surveyors at the Universities of Michigan and Detroit, Michigan State College and Michigan College of Mining and Technology, June 20-22.

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